

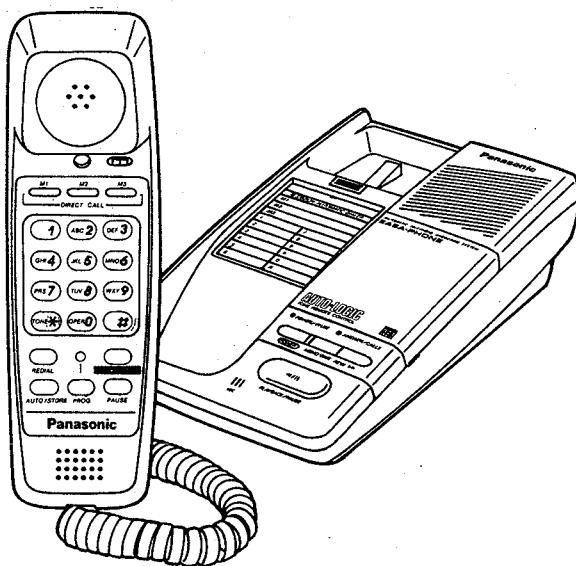
Service Manual

and Technical Guide

AUTO-LOGIC™

EASA-PHONE®Integrated Telephone System
with a Single Micro Cassette

Telephone Equipment

KX-T2388**SPECIFICATIONS****General:**

Power Source: AC; AC adaptor KX-A11-W (DC 12 V)

Power Output: 350 mW (max.)

Speaker: Unit; 5 cm (1³/₄) PM dynamicHandset; 3 cm (1³/₁₆) PM magnetic
type receiver unit

Microphone: Condenser microphone

Jacks: Telephone line, DC IN

Dimensions: 5¹/₂" x 8¹³/₁₆" x 3²¹/₃₂"

(with handset)

[127 (W) x 224 (D) x 93 (H) mm]

Weight: 1.9 lbs. (0.9 kg) without cassette tapes

Tape Deck Section:

Outgoing Message

(OGM),

Incoming Message

(ICM):

Single Micro Cassette (MC-30)

Tape Speed: 2.4 cm/s

Wow and Flutter: 0.58% (WRMS)

Motor: Electrical governor motor

Design and specifications are subject to change without notice.

Telephone Section:**Memory Capacity:**12 telephone numbers, up to 30 digits for
each station/3 telephone numbers, up to
30 digits for each Direct Call Button**Dial Speed:**

Tone (DTMF)/Pulse (10 pps)

Redial:Last dialed telephone number every time redial
button is pressed**Pause:**

Time delay (3.5 seconds per pause)

Matsushita Services Company
Division of Matsushita Electric
Corporation of America
50 Meadowland Parkway,
Secaucus, New Jersey 07094

Matsushita Electric
of Canada Limited
5770 Ambler Drive, Mississauga,
Ontario, L4W 2T3

Panasonic Sales Company,
Division of Matsushita Electric
of Puerto Rico, Inc.
San Gabriel Industrial Park
65th Infantry Ave. Km.9.5
Carolina, Puerto Rico 00630

Panasonic

When you mention the serial number, write down the 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

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CONNECTION

Connect as shown.

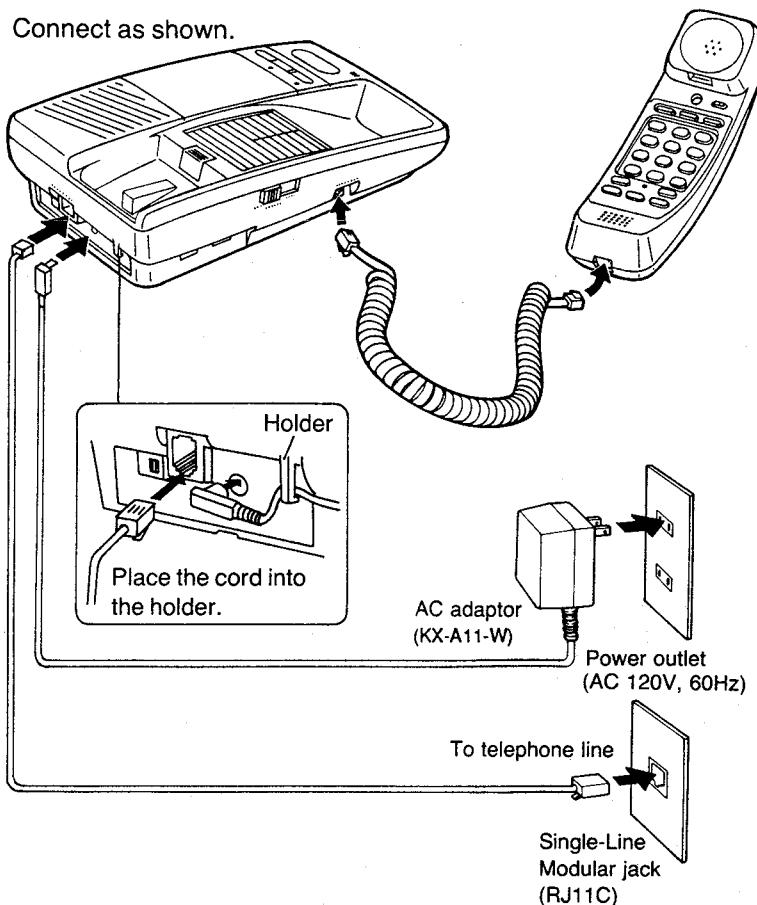


Fig. 1

LOCATION OF CONTROLS

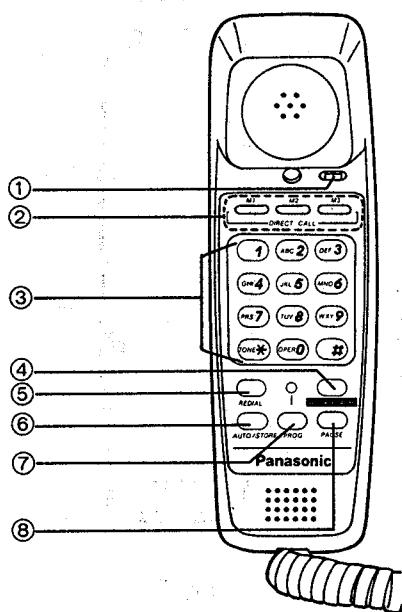


Fig. 2

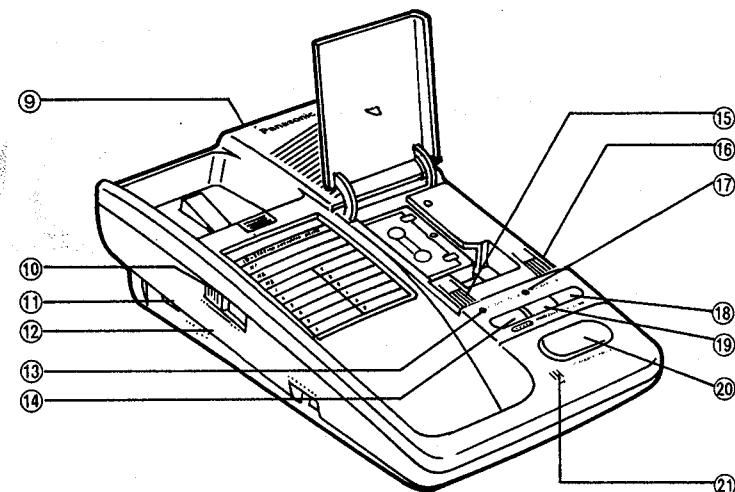


Fig. 3

- ① DIALING MODE selector:
Used to change the dialing mode TONE or PULSE.
- ② DIRECT CALL buttons:
Used to store phone numbers and to make calls using one-touch dialing.
- ③ Dial key pads:
Used to dial or program phone numbers.
- ④ HOOK/FLASH button:
Flash usage...Used to access some of the feature of your host PBX by pressing it lightly.
Hook usage...Used to terminate the telephone line by pressing it firmly (for 1~2 seconds). You can dial next phone number without hanging up.
- ⑤ REDIAL button:
Used to redial the last dialed phone number.
- ⑥ AUTO/STORE button:
Used to store phone numbers.
- ⑦ Program (PROG.) button:
Used to start and complete the programming procedures.
- ⑧ PAUSE button:
Used to enter a pause in phone numbers when programming or dialing.
- ⑨ CPC selector:
Selector for call waiting service.
- ⑩ VOLUME control
- ⑪ Number of rings (RINGS) selector:
Used to select the number of rings that it takes for the unit to answer.
- ⑫ Ringer volume (RINGER) selector
- ⑬ POWER/IN USE indicator
- ⑭ POWER button:
Used to turn on and off the unit. The POWER/IN USE indicator lights when the unit is turned on.
- ⑮ OGM REC button:
Used to record the Outgoing Message.
- ⑯ OGM PLAY button:
Used to play the recorded Outgoing Message.
- ⑰ ANSWER/CALLS indicator
- ⑱ Rewind (REW) button:
Used to rewind the cassette tape.
- ⑲ MEMO/2 WAY button:
Used to record a memo message or a telephone conversation.
- ⑳ PLAYBACK/PAUSE button:
Used to play back the recorded Incoming Messages and to stop the ICM tape temporarily during ICM playback.
- ㉑ Microphone (MIC)

DISASSEMBLY INSTRUCTIONS

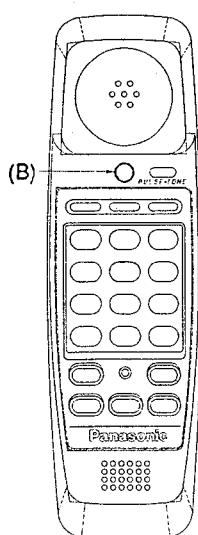


Fig. 4

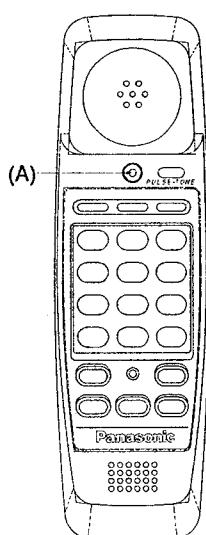


Fig. 5

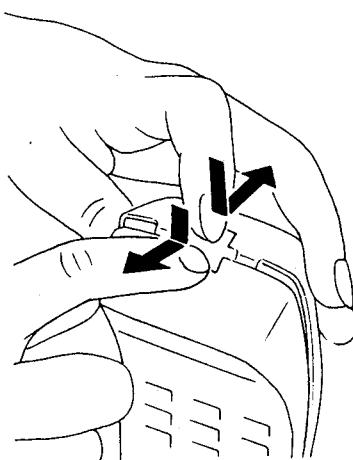


Fig. 6

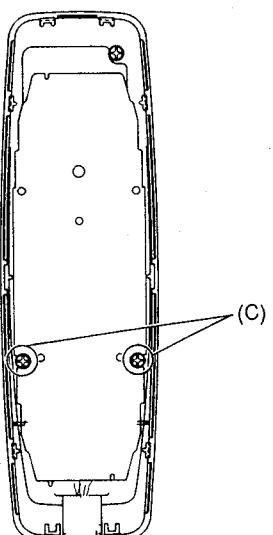


Fig. 7

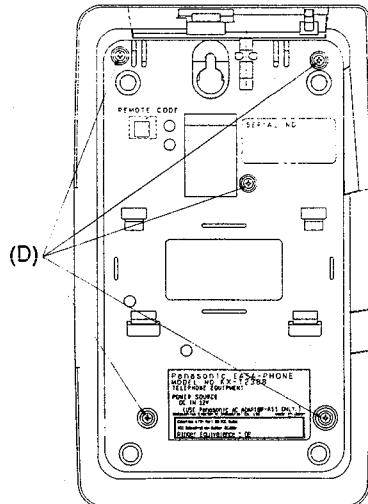


Fig. 8

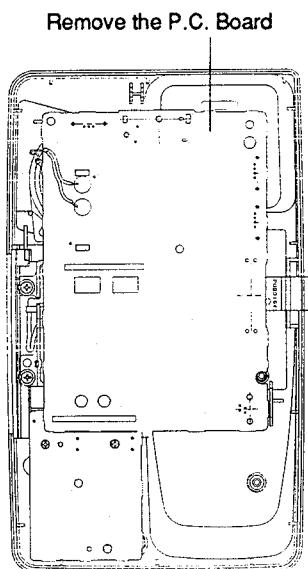


Fig. 9

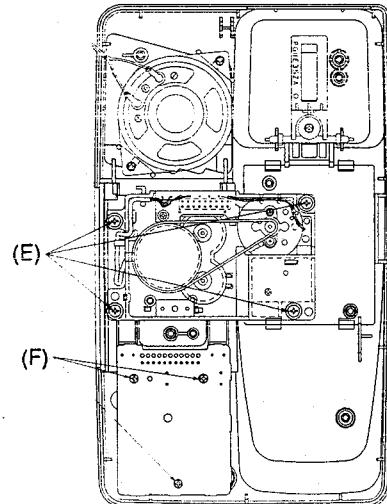
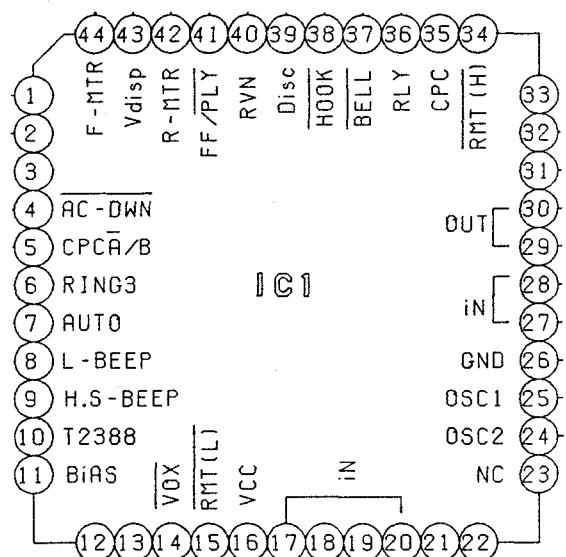


Fig. 10

Ref. No.	Procedure	Shown in Fig.—.	To remove—.	Remove—.
1	1~3	4	Cabinet Cover	Remove the rubber cap (A)
2		5		Screw (2.6×20) (B)×1
3		6		Remove the cabinet cover.
4	1~4	7	Printed Circuit Board	Screws (2.6×10) (C)×2
5	5	8	Cabinet Cover	Screws (3×14) (D)×5
6	5, 6	9	Printed Circuit Board	Remove the Main Printed Circuit Board
7	5, 6, 7	10	Cassette Deck	Screws (3×10) (E)×4
8	5, 6, 8	10	Sub P. C. Board	Screws (3×8) (F)×3

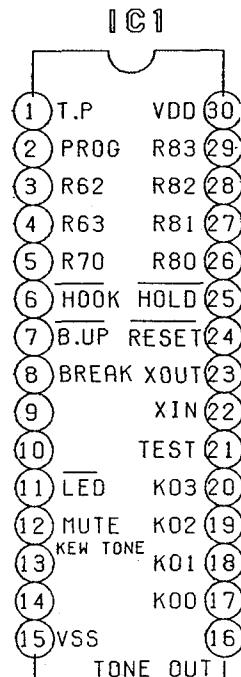
CPU DATA



<For Cradle>

IC1: PQVI4149HA35
 Program ROM: 4K
 Internal RAM: 128 x 4 Kbit
 Clock Frequency: 4MHz
 Power Supply Voltage: 5.4V or 5V

Pin No.	Function	High	Low	Pin No.	Function	High	Low
1	PLT	ON	OFF	23	NC		
2	PLL	ON	OFF	24	OSC2		
3	RLY2	Active		25	OSC1		
4	AC DOWN	Normal	AC-Down	26	GND		GND
5	CPC A/B SW	CPC-B	CPC-A	27	Key Input		Key Push
6	RING3	Ring3	Ring5	28	Key Input		Key Push
7	AUTO	Auto	Ring5	29	Strobe		Active
8	Line-Beep			30	Strobe		Active
9	SP-Head-Beep			31	Power LED	ON	OFF
10	-----	Vcc		32	Answer LED	ON	OFF
11	Rec Bias	REC	PLAY	33	NC		
12	Data			34	RMT		Remote
13	Clock			35	CPC		
14	Vox	Disable	Enable	36	PLY		
15	RMT		Remote	37	BELL		Bell
16	Vcc	Vcc		38	HOOK SW	On-Hook	Off-Hook
17	OGMR			39	-----		GND
18	OGMP			40	RVN		
19	Memo			41	FF Motor	ON	OFF
20	Rew			42	Rew Motor	ON	OFF
21	Reset	Reset		43	V disp		GND
22	Test	Normal	CPC Test	44	Play Motor	ON	OFF

**<For Handset>****IC1: PQVI451N9968**

Program ROM: 4K byte (8 bit)

Internal RAM: 768 byte (4 bit)

System Clock Frequency: 480 kHz

Power Supply Voltage: 2.2~6V

Pin No.	Function	High	Low
1	Tone/Pulse SW input		
2	Program Key Input	Disable	Enable
3	Option Data Input		
4	Option Data Input		
5	Store LED Output Control	OFF	ON
6	Hook Input	Circuit OFF	Circuit ON
7	Mute Control Output	OFF	ON
8	Pulse Dial Output	Break	Make
9	Backup Signal		
10	Backup Signal	Active	Normal
11	Backup Signal		
12	Backup Signal		
13	Key Tone Output	Key Tone Output	
14	Pull Up Power Output	Enable	Disable
15	GND Terminal		
16	DTMF Signal Output	Active	Normal
17	Key Input		
18	Key Input	Disable	Enable
19	Key Input		
20	Key Input		
21	Not Used		Normal
22	System Clock		
23	System Clock		
24	System Reset Signal	Normal	Reset
25	Line Power Input	Active	Standby
26	Key-Scan Output		
27	Key-Scan Output	Normal	Active
28	Key-Scan Output		
29	Key-Scan Output		
30	+ Power Source Terminal		

IC BLOCK DIAGRAM

IC3 PQVIBA8205

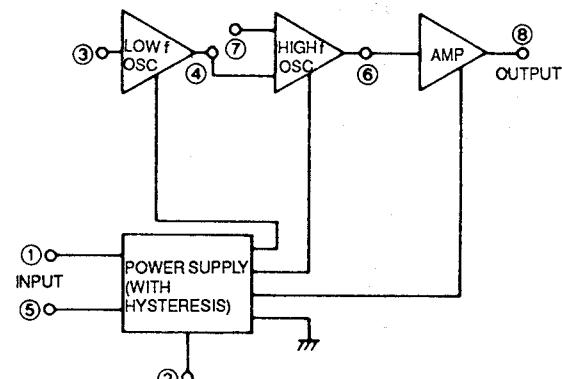


Fig. 11

IC4, 5 PQVIIR3N05

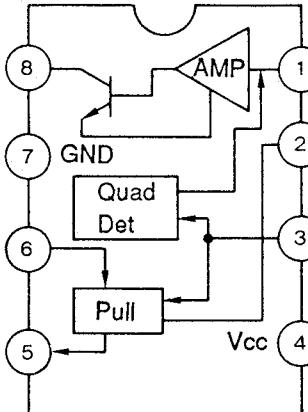


Fig. 12

IC2 PQVISC79100P (for Cradle)

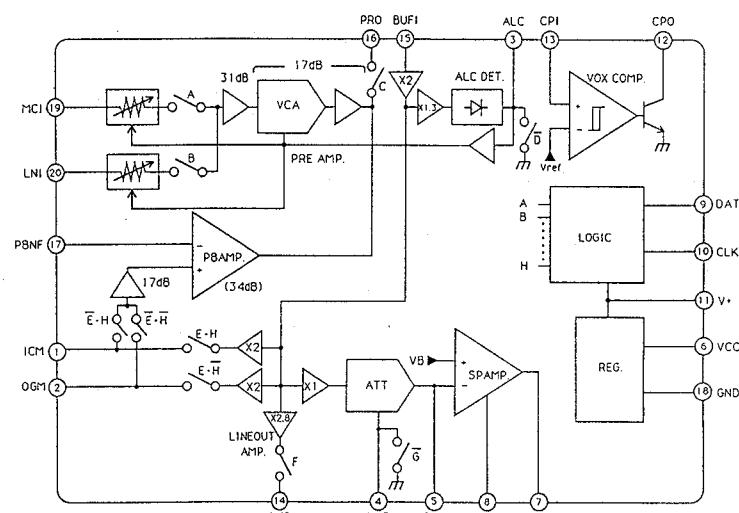
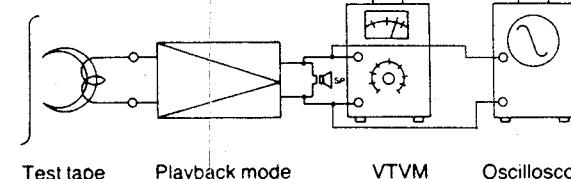
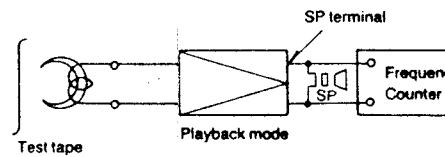


Fig. 13

MEASUREMENT AND ADJUSTMENT METHOD

Notes:

1. Make sure the heads are clean.
2. Make sure the capstan and pressure roller are clean.
3. Room temperature for measuring and adjusting: $20 \pm 5^\circ\text{C}$ ($68 \pm 9^\circ\text{F}$)
4. Test equipments are not treated as replacement parts.

ITEM	MEASUREMENT & ADJUSTMENT	REMARKS
1. Head azimuth adjustment	<ol style="list-style-type: none"> 1. Play back test tape (QZZMWA). 2. Adjust screw (B) shown in fig. B for maximum output at SP terminal. (Test equipment connection is shown below.)  <p>Test tape Playback mode VTVM Oscilloscope</p> <p>Fig. A</p>	*Record/playback head
2. Tape speed adjustment	<ol style="list-style-type: none"> 1. Play back test tape (QZZMWA). 2. Adjust VR4 for 2990 ± 10 Hz on frequency counter reading.  <p>Test tape Playback mode Frequency Counter</p> <p>Fig. C</p>	

PULL Adjustment

① fH Adjustment

1. Connect IC4 ③ pin and ⑦ pin, with a capacitor ($10 \mu\text{F}$).
2. Connect the frequency counter and oscilloscope.

 - ⊕ side...IC4 ⑤ pin
 - ⊖ side...IC4 ⑦ pin

3. Adjust VR2 for $fH \pm 10$ Hz on the frequency counter reading (Refer to below table).

② fL Adjustment

1. Connect IC5 ③ pin and ⑦ pin, with a capacitor ($10 \mu\text{F}$).
2. Connect the frequency counter and oscilloscope.

 - ⊕ side...IC5 ⑤ pin
 - ⊖ side...IC5 ⑦ pin

3. Adjust VR3 for $fL \pm 10$ Hz on the frequency counter reading (Refer to below table).

Component View

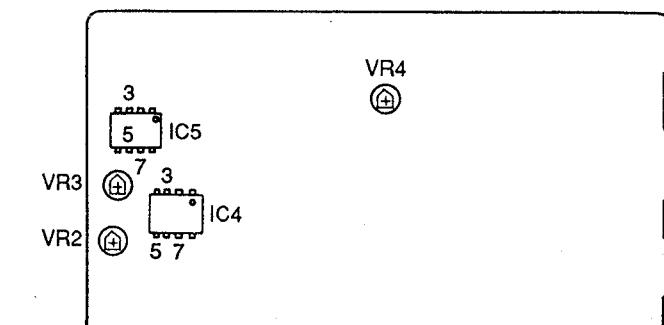
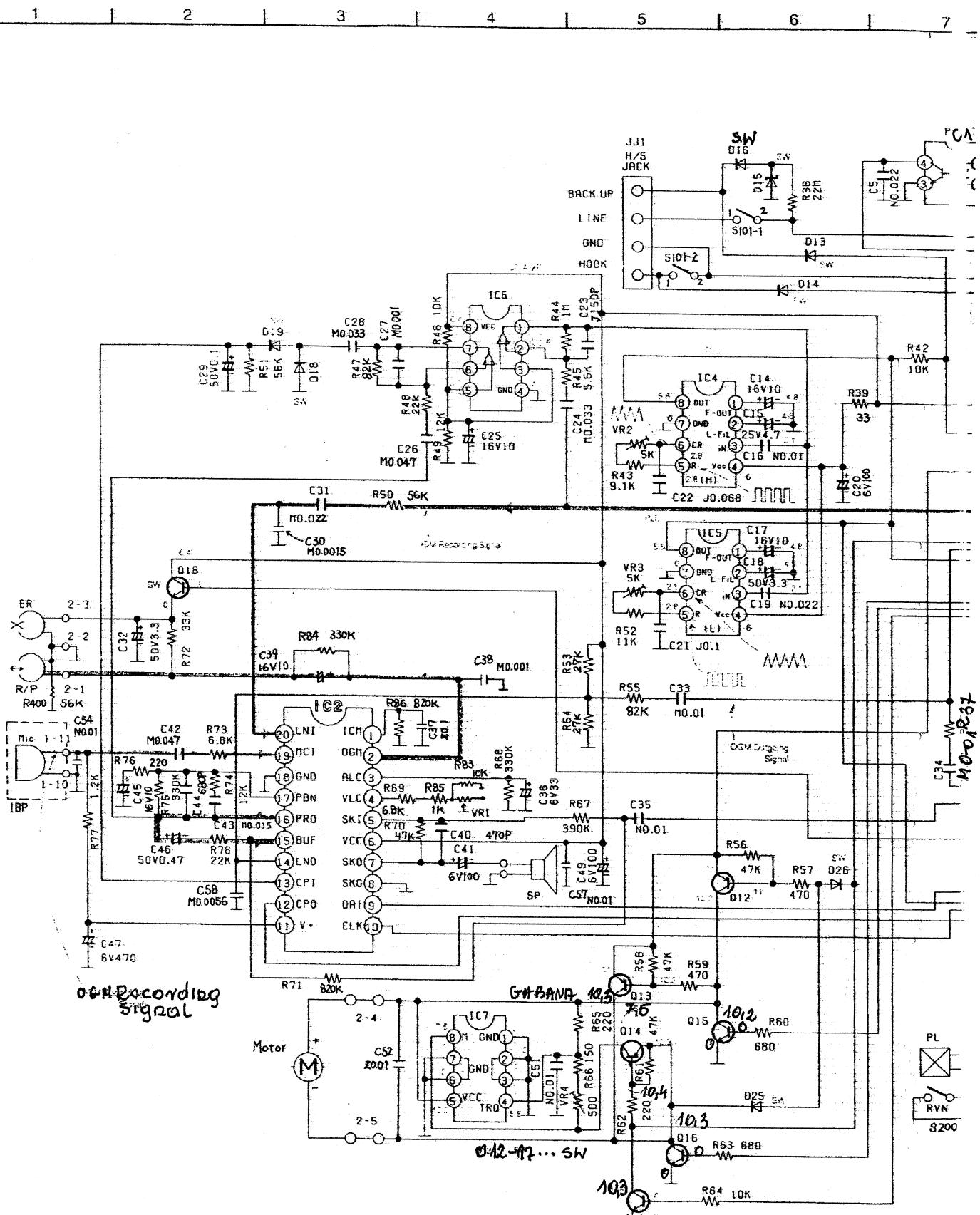


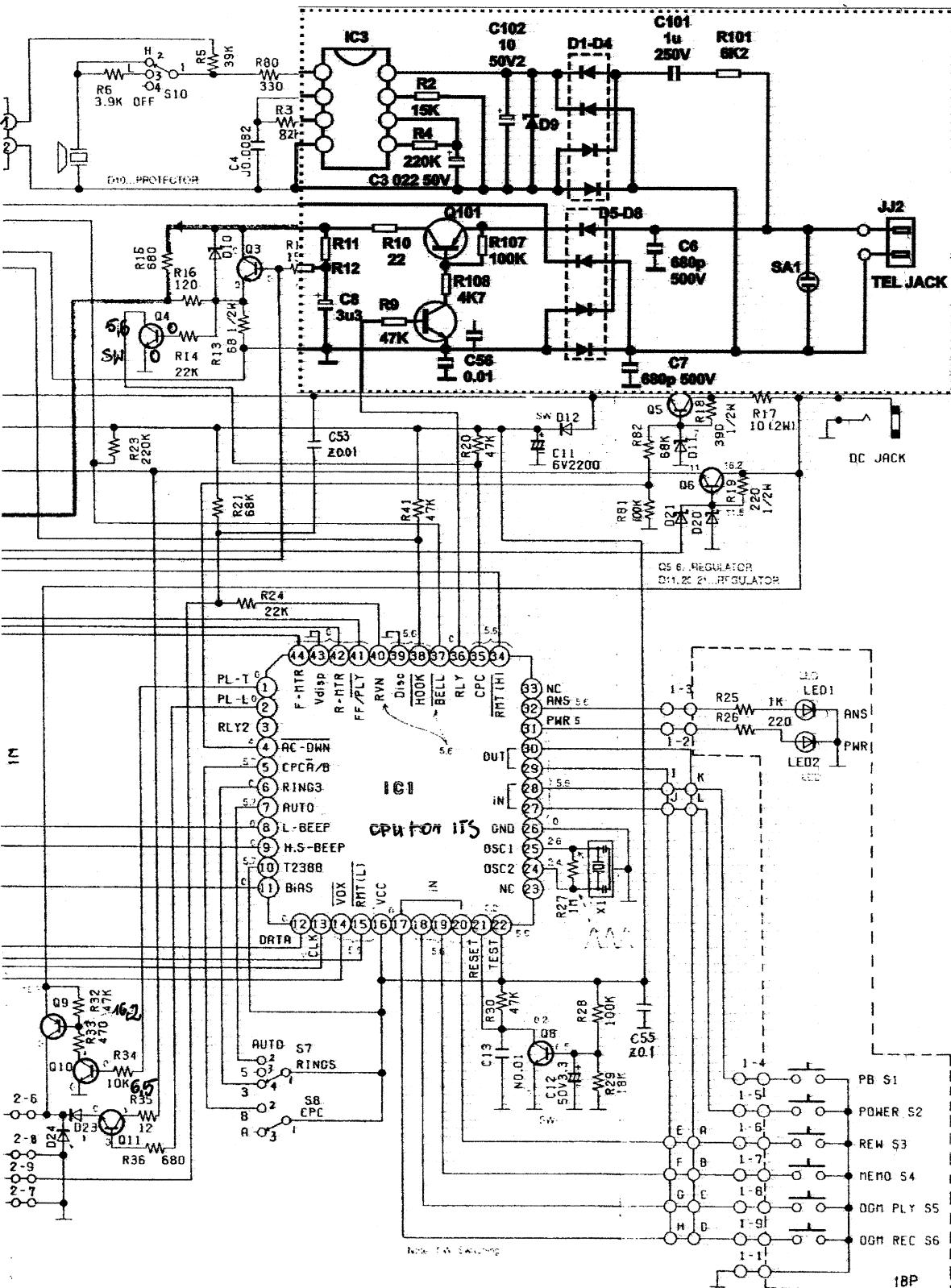
Fig. 14

Label No.
(Bottom of the cradle) →

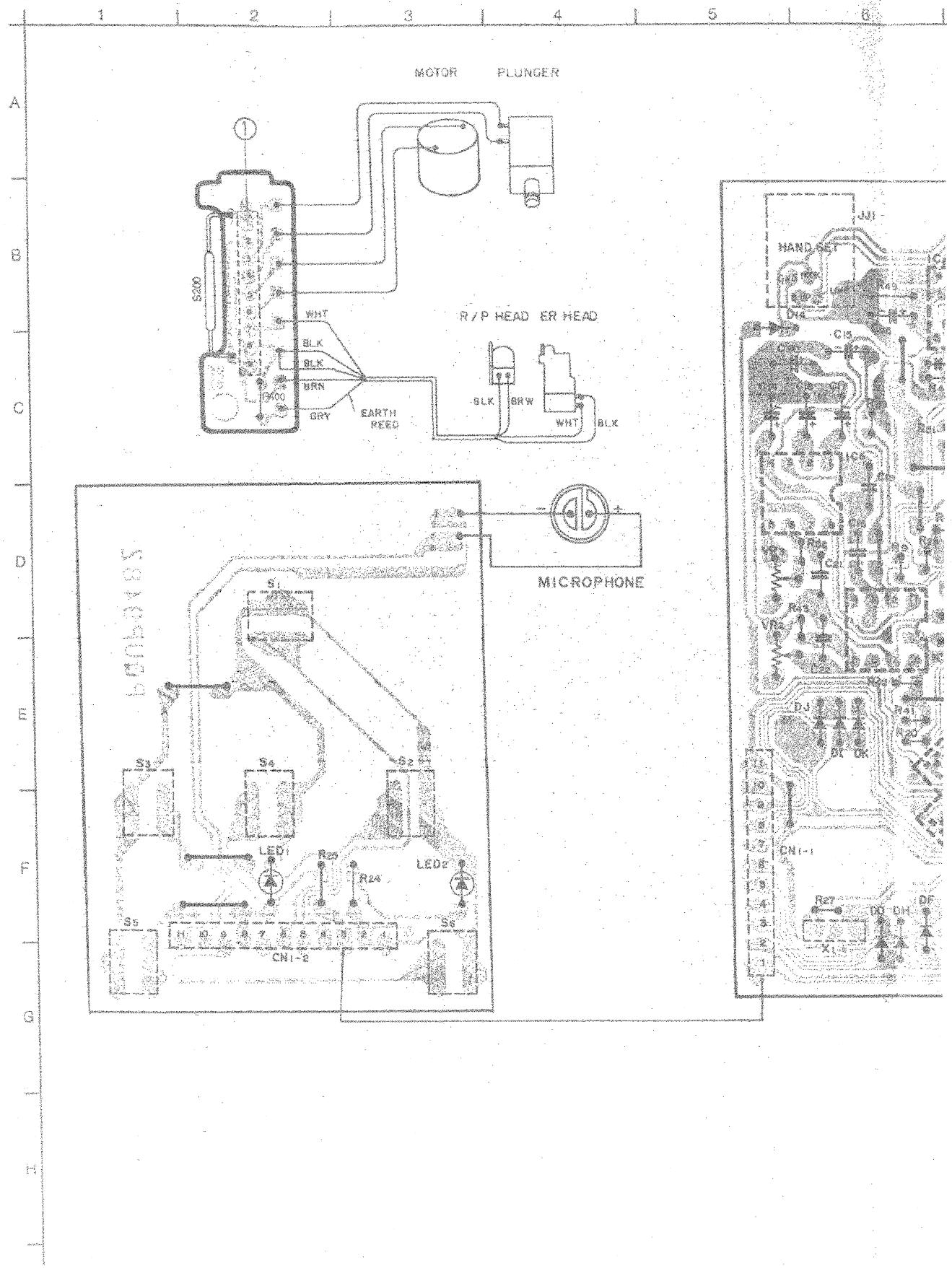
Code	fH (Hz)	fL (Hz)	Code	fH (Hz)	fL (Hz)
1	1209	697	6	1477	770
2	1336	697	7	1209	852
3	1477	697	8	1336	852
4	1209	770	9	1477	852
5	1336	770			

SCHEMATIC DIAGRAM (for



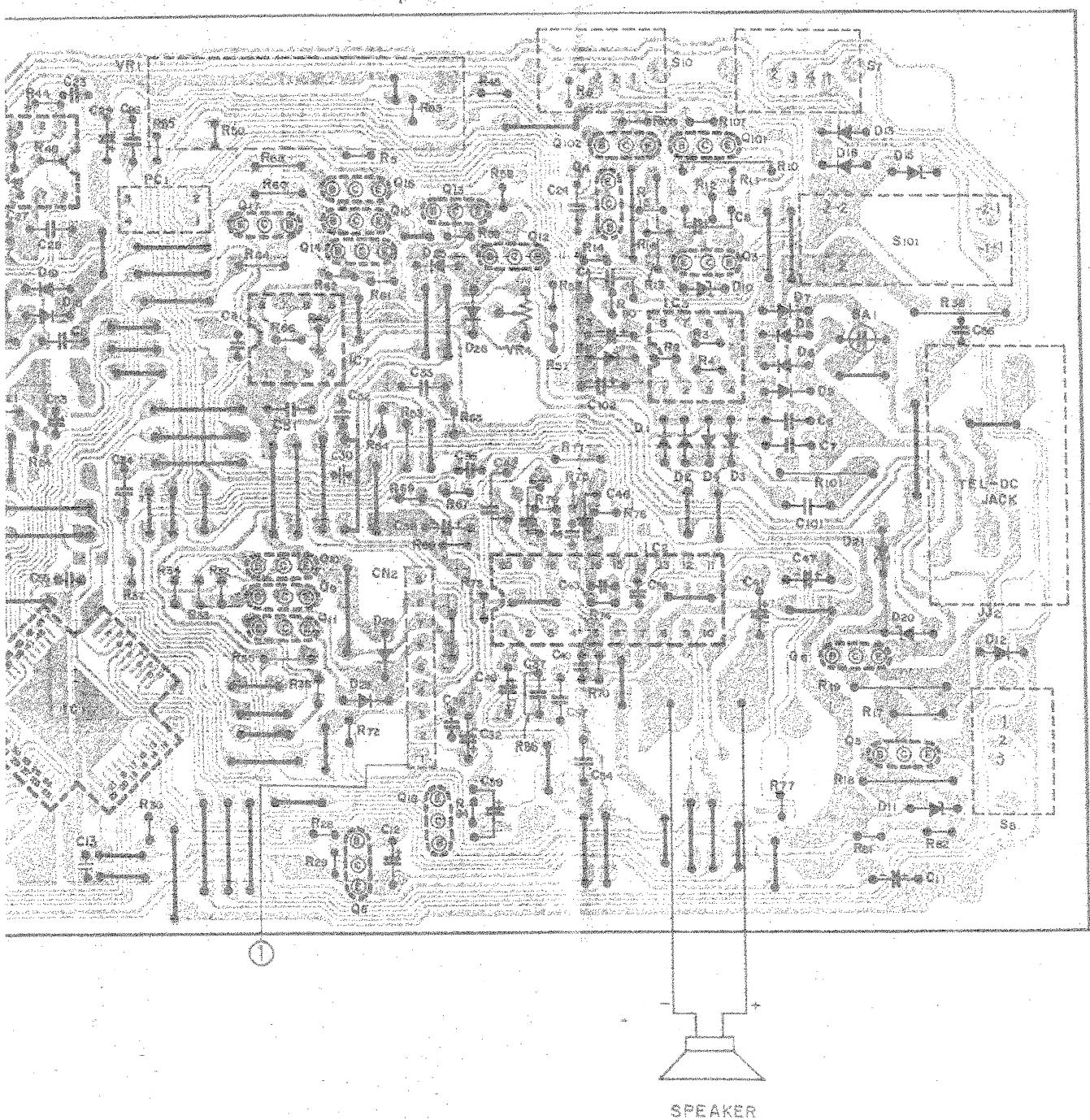


CIRCUIT BOARD AND WIRING (1)



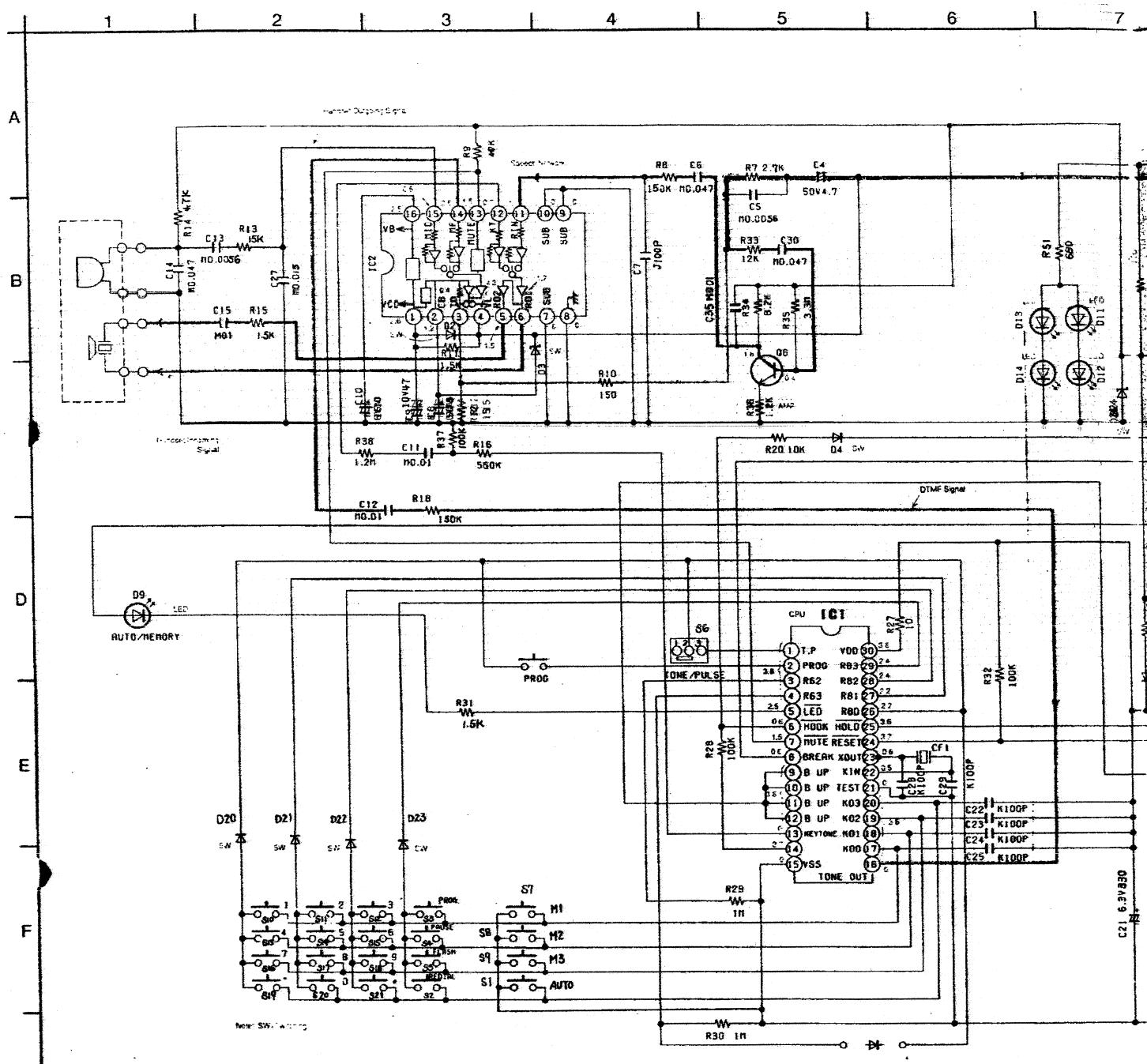
CONNECTION DIAGRAM (for CRADLE)

Component View



This circuit board may be modified at any time with the development of new technology.

SCHEMATIC DIAGRAM (for H)



Note:

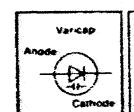
(For Cradle)

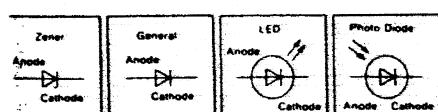
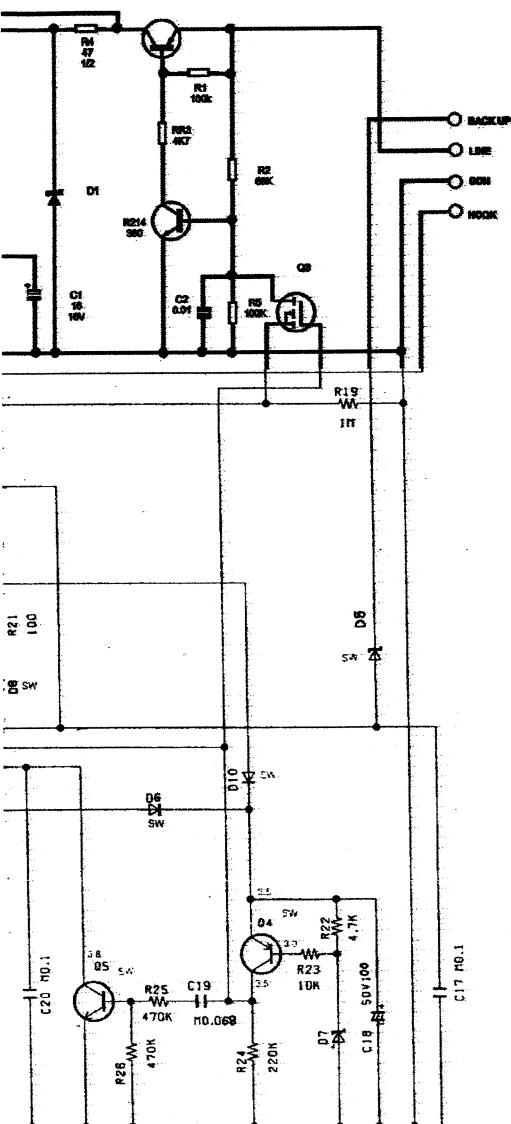
1. S1: Playback/Pause switch.
2. S2: Power switch.
3. S3: Rewind switch.
4. S4: Memo/2 way switch.
5. S5: OGM play switch.
6. S6: OGM rec switch.
7. S7: Rings switch.
8. S8: C.P.C. switch.
9. S10: Ringer volume selector switch in "HIGH" position.
10. S101: Hook switch in "OFF-HOOK" position.
11. S200: Reed switch.

(For Handset)

1. S1: Auto switch.
2. S2: Redial switch.
3. S3: Program switch.
4. S4: Pause switch.
5. S5: Flash switch.
6. S6: Dialing mode selector switch.
7. S7-9: Direct call switch.
8. S10-21: Dialing switch.

This schematic diagram may be modified at any time with the development of new technology.

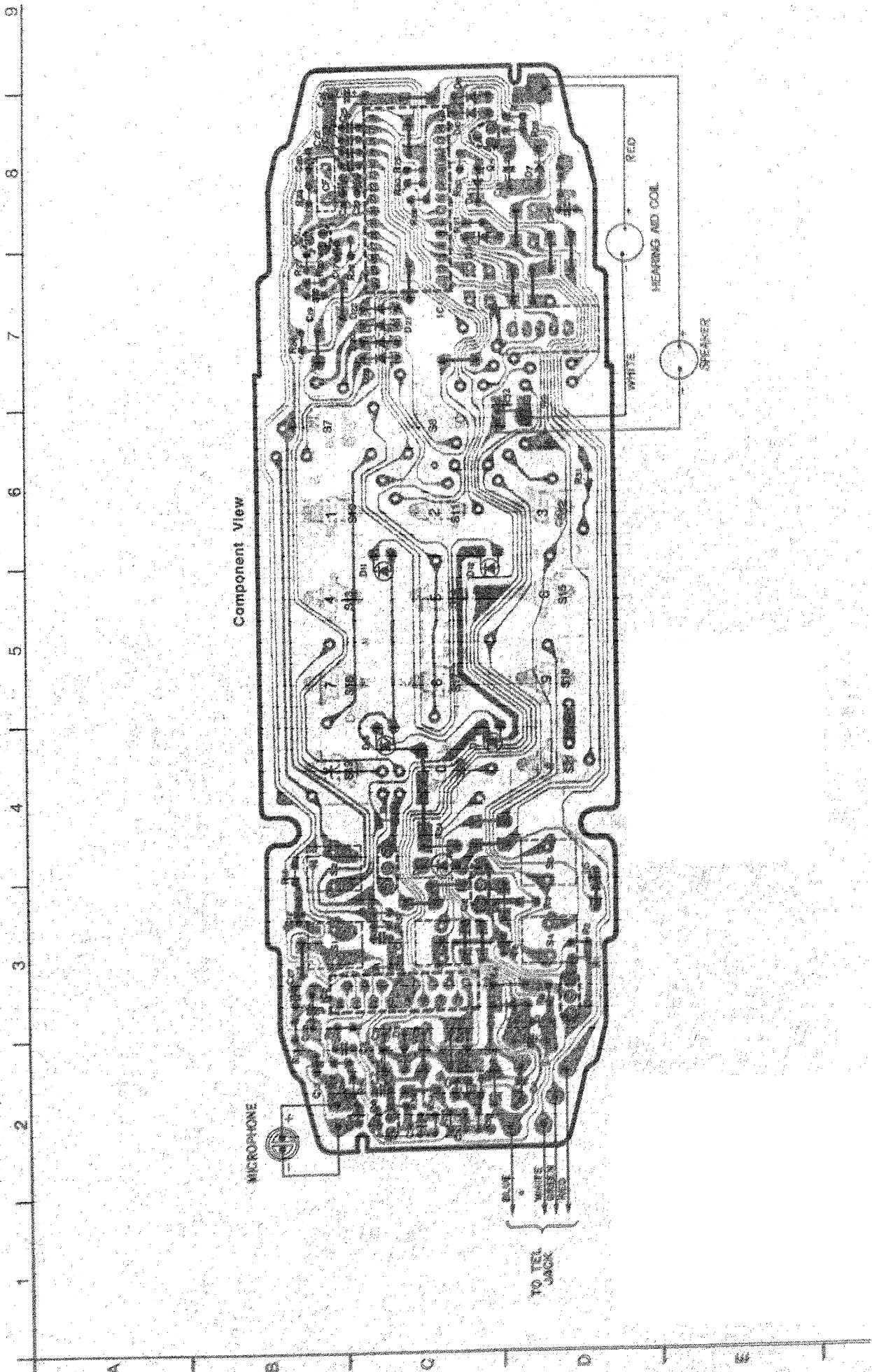




TERMINAL GUIDE OF IC'S, TRANSISTORS AND DIODES

		Cathode Anode PQVDS5688G
		Anode Cathode MA4300 MA4180 MA4062
		Anode Cathode MA4056
		Anode Cathode MA700A
		Anode Cathode PQVDMJ5.6A PQVDMTZ11B PQVD05AZ3.0 1SS131 PQVDMTZ6R8 1SS119
		Cathode Anode PQVDSLZ135B2 PQVDSLZ225B3
		Anode Cathode LN363GPPKU PQVDMZJ2R4B

CIRCUIT BOARD AND WIRING CONNECTION DIAGRAM (for HANDSET)



BLOCK DIAGRAM

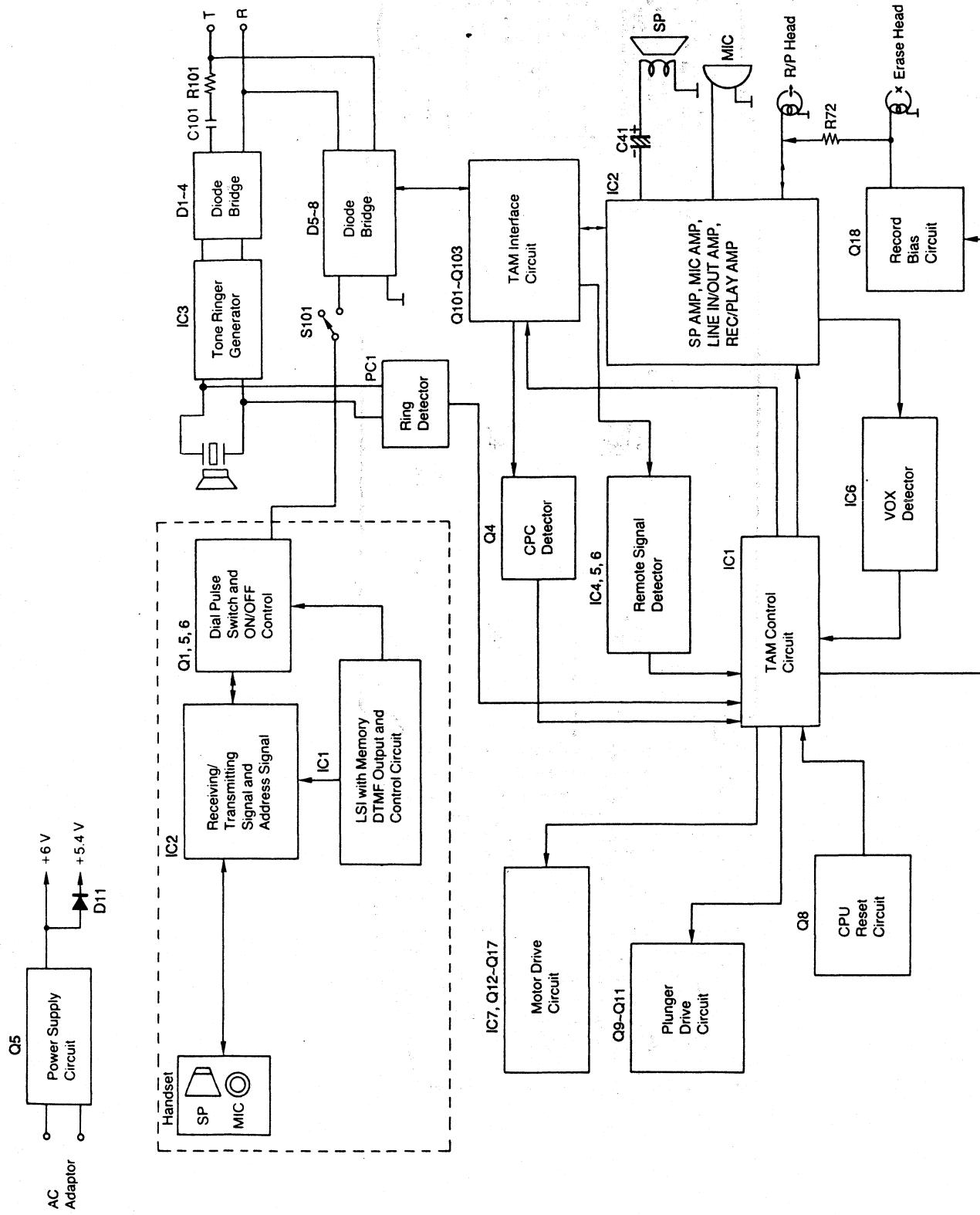


Fig. 15

CIRCUIT OPERATIONS

Note:

The circuit diagram may be modified at any time with the development of new technology.

■ TELEPHONE LINE INTERFACE

When the hook switch S101 is ON (off-hook), the circuit is closed, and current is supplied to the base of Q2 via the diode bridge D5~D8, and Q2 is ON \rightarrow Q1 is ON (OFF-HOOK condition).
 Q1 and Q2 are the dial pulse generating circuits, and are driven by the CPU (IC1), when the collector of Q4 is high logic level \rightarrow Q3 is ON \rightarrow Q2 is OFF and Q1 is OFF. (break)
 If port 8 is LOW \rightarrow Q3 is OFF \rightarrow Q2 is ON \rightarrow Q1 is ON. (make)
 The ring signal is outputted from pin 8 of IC3, and its volume is adjusted in 3 steps (H-L-OFF) by Ringer SW then impressed on the ceramic sound generator, and so is generated.

R2 Bell sensitivity adjustment
 R3, C4 Bell frequency setting f_{H1}, f_{H2}
 R4, C3 Repeat frequency setting f_L
 f_{H1}, f_{H2}, f_L are derived from the following formulas:

$$f_{H1} = \frac{1}{1.515 \times R3 \times C4} \quad 1 \quad 982 \text{ Hz}$$

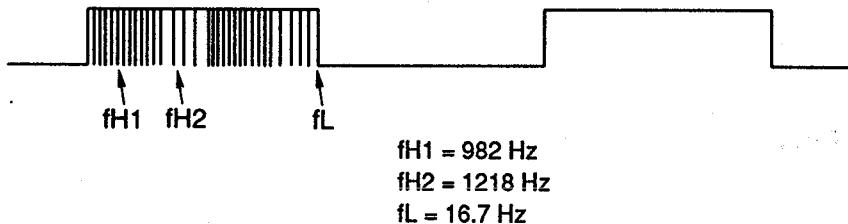
$$f_L = \frac{1}{1.234 \times R4 \times C3} \quad 1 \quad 16.7 \text{ Hz}$$

$$R3 = 82 \text{ k} \quad C4 = 0.0082 \mu\text{F} \quad R4 = 220 \text{ k} \quad C3 = 0.22 \mu\text{F}$$

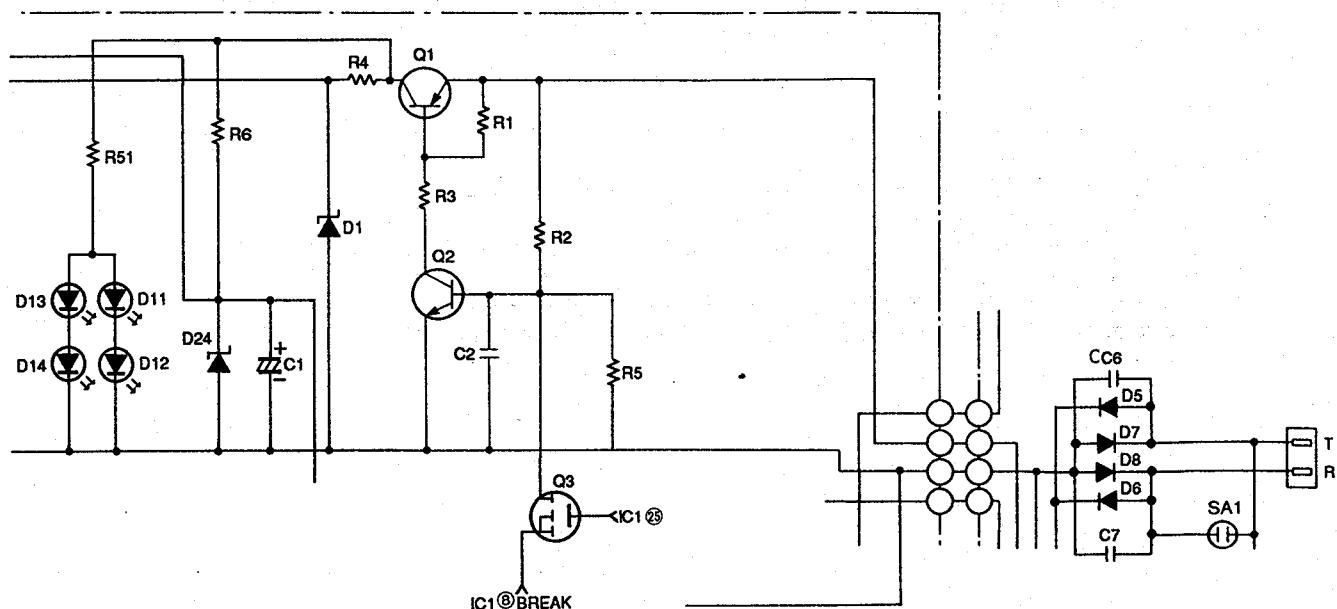
$$f_{H2} = 1.24 \times f_{H1} = 1218 \text{ Hz}$$

The following shows the waveform of the tone ringing IC output:

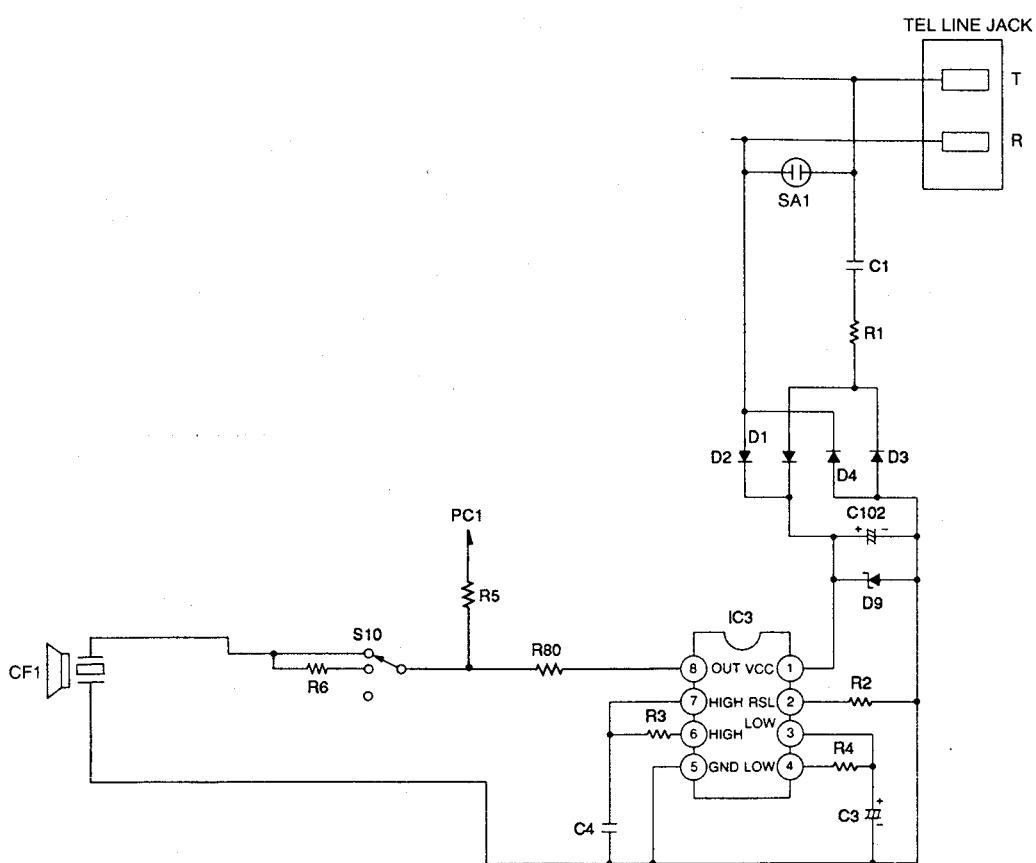
IC3 ⑧ pin



Circuit Diagram (for Handset)



Circuit Diagram (for Cradle)



■ TONE DIAL CIRCUIT

Function:

The tone dial circuit consists of a DTMF (Dual Tone Multi Frequency) signal generator (outputted from pin 13 of the microprocessor) for tone dialing, and also a circuit for outputting the signal to line.

The DTMF circuit identifies inputs from 12 keys (1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *, #) by means of a total of seven frequencies, that is four low frequencies (Low group) and three high frequencies (High group).

Circuit Operation:

When a dial key is pressed, a DTMF signal is outputted from pin 16 of IC1 as an analog synthetic wave.

The signal flow to the line is as follows.

Pin 13 of IC1 → R16 → C11 → R38 → pin 12 of IC2 → pin 4 and 5 of IC2.

The DTMF signal is sent to the line via the following path.

IC2 is an amplifier which is used to output the signal to line.

The 1 KHz confirmation tone is heard from the speaker of the handset.

Pin 16 of IC1 → R18 → C12 → pin 14 of IC2 → pin 4 of IC2 → Telephone Line.

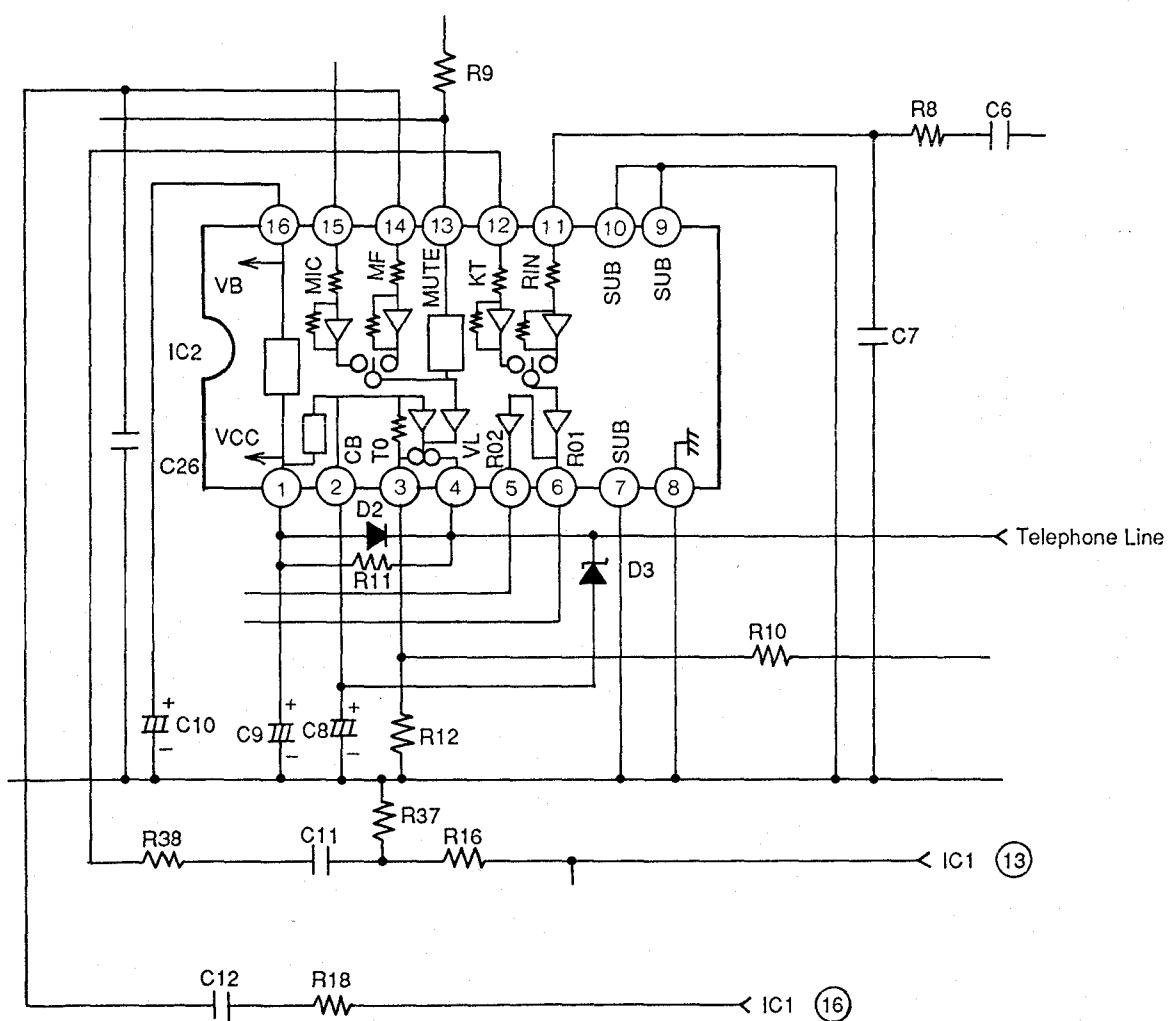
The signal combination and frequency corresponding to each dial key is shown below.

Tone Frequencies

High Group	H1	H2	H3	
Low Group	L1	1	2	3
	L2	4	5	6
	L3	7	8	9
	L4	*	0	#

Low Group	Frequencies	High Group	Frequencies
L1	697 Hz \pm 1.5%	H1	1209 Hz \pm 1.5%
L2	770 Hz \pm 1.5%	H2	1336 Hz \pm 1.5%
L3	852 Hz \pm 1.5%	H3	1477 Hz \pm 1.5%
L4	941 Hz \pm 1.5%		

Circuit Diagram



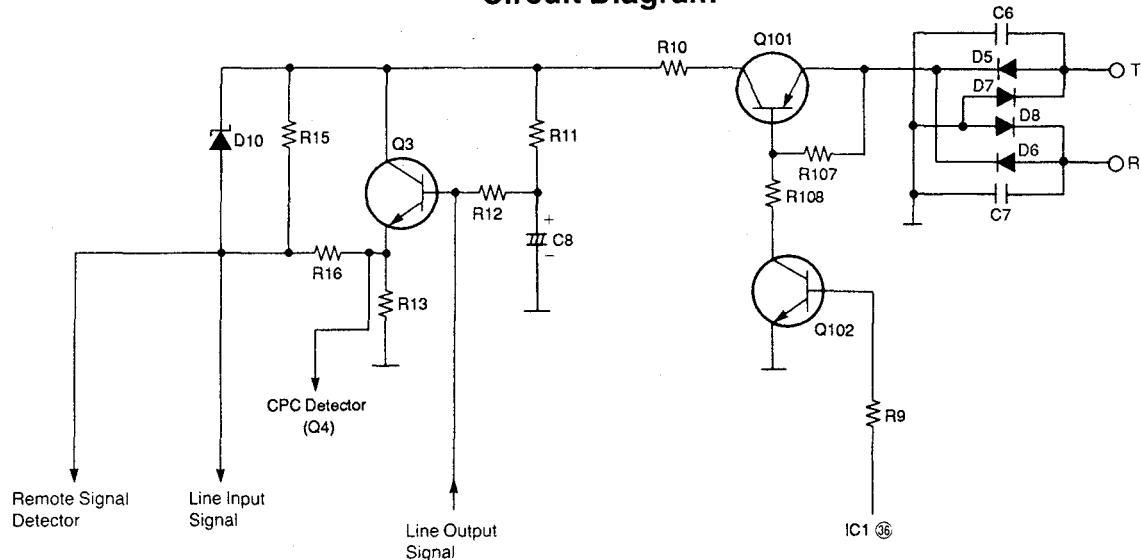
■ TAM INTERFACE CIRCUIT

Function:

When the bell rings in the answer mode, IC1 pin 36 becomes "H" (normally "L") and Q102 goes ON, hence Q101 goes ON, connecting it to the line. In other words, the DC loop Tel. line \rightarrow D5-D8 \rightarrow Q101 \rightarrow R10 \rightarrow Q3 \rightarrow R13 \rightarrow D5-D8 \rightarrow Tel. line is formed.

The send signal to the line and the input signal from the pass back and forth via Q3.

Circuit Diagram

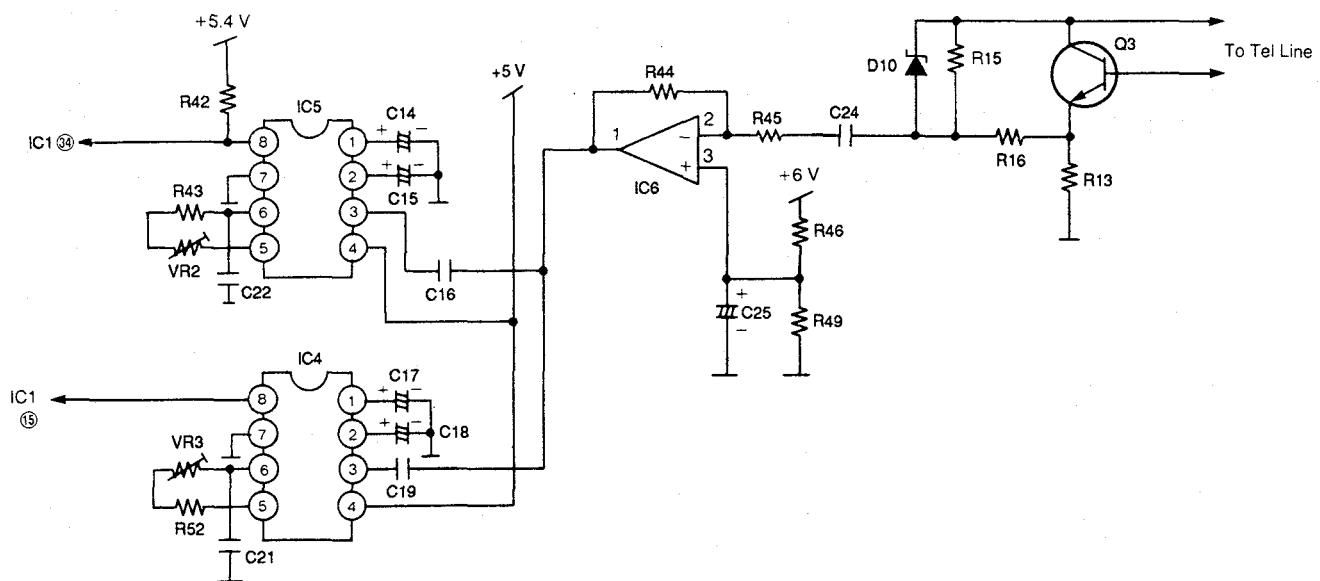


■ REMOTE SIGNAL DETECTOR

Function:

The remote control signal passes through C24, then amplified by the amplifier consisting of IC6, and detected by IC4 and IC5 (tone detector ICs). The DTMF signal is a combination of these two frequencies. In this circuit the lower frequency f_L is detected by IC5, and the higher frequency f_H is detected by IC4. When f_L is input, IC5 pin 8 becomes "L", and when f_H is input, IC4 pin 8 becomes "L". When both of the outputs from pin 8 of IC5 and IC4 are "L", "L" level are input to IC1 pin 15 and pin 34, and the DTMF signal (remote control signal) is detected.

Circuit Diagram



■ INITIALIZE CIRCUIT

Function:

This circuit is used for initializing the microcomputer when it incorporates an AC adapter.

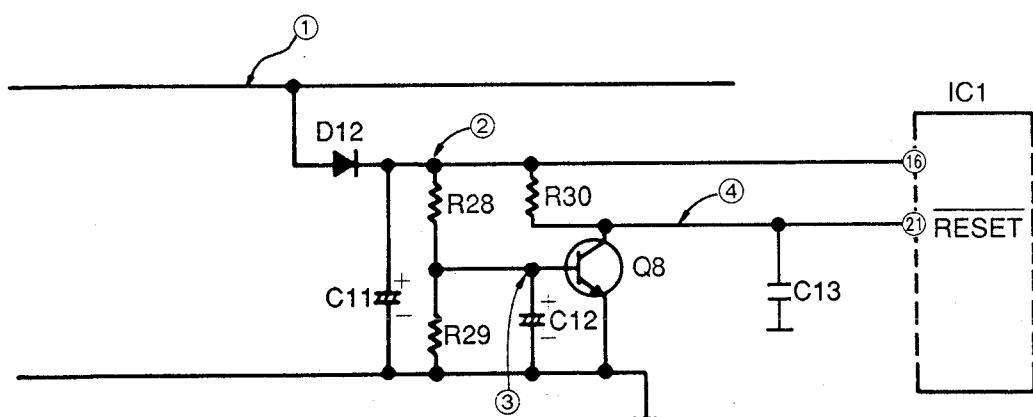
Circuit Operation:

The voltage is shifted by D12 and power is supplied to the CPU.

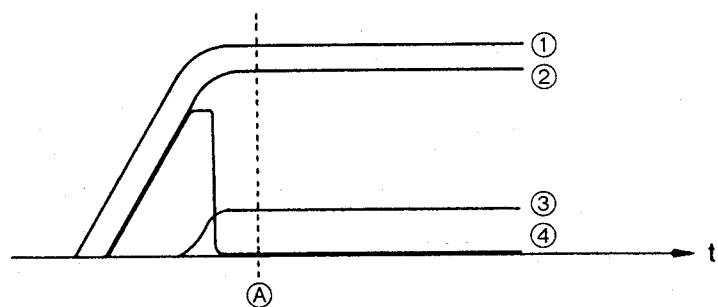
The voltage, needed to reset the CPU, is supplied from the collector of Q8.

When Q8 becomes ON and the reset terminal voltage drops, the CPU has been reset, and the set can operate beyond point A in the circuit voltage diagram.

Circuit Diagram



Circuit Voltage



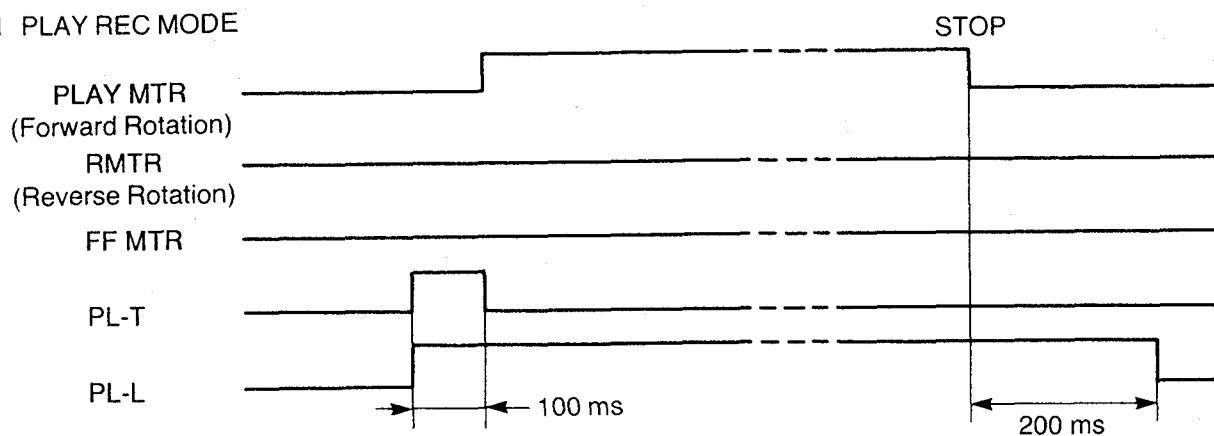
■ TAPE TRANSPORT CONTROL

Circuit Operation:

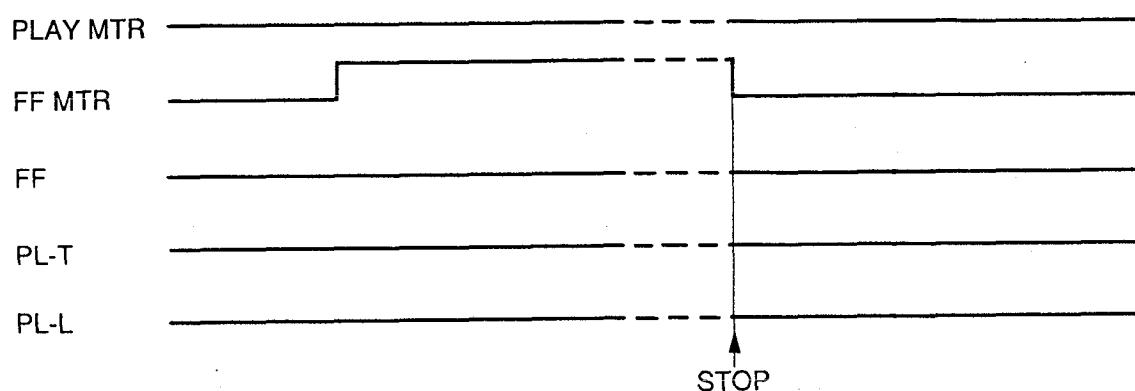
The timing for the plunger and motor which are used to operate the deck is as shown in the timing chart.

Timing Chart

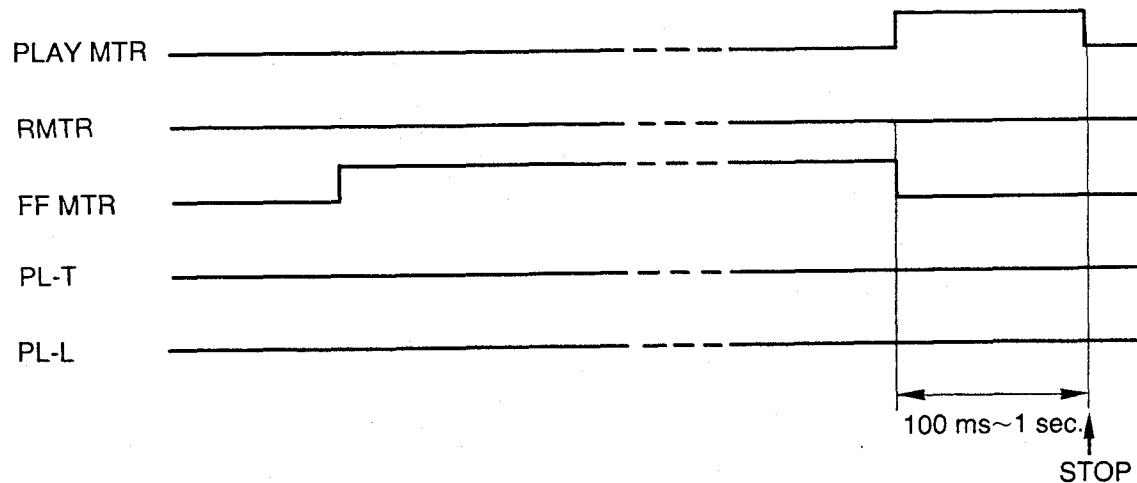
1 PLAY REC MODE



2 REW MODE



3 FF MODE



■ MOTOR DRIVE CIRCUIT

Playback (or Recording)

When IC1 pin 44 becomes "H" and Q17 ON. And then the motor voltage supplied from Q6 changes to the voltage on playing. When IC1 pin 44 becomes "H" Q17 ON → Q14 → Q12 ON thus the governor (IC7) is activated and the motor voltage is regulated, hence the motors run at a constant speed.

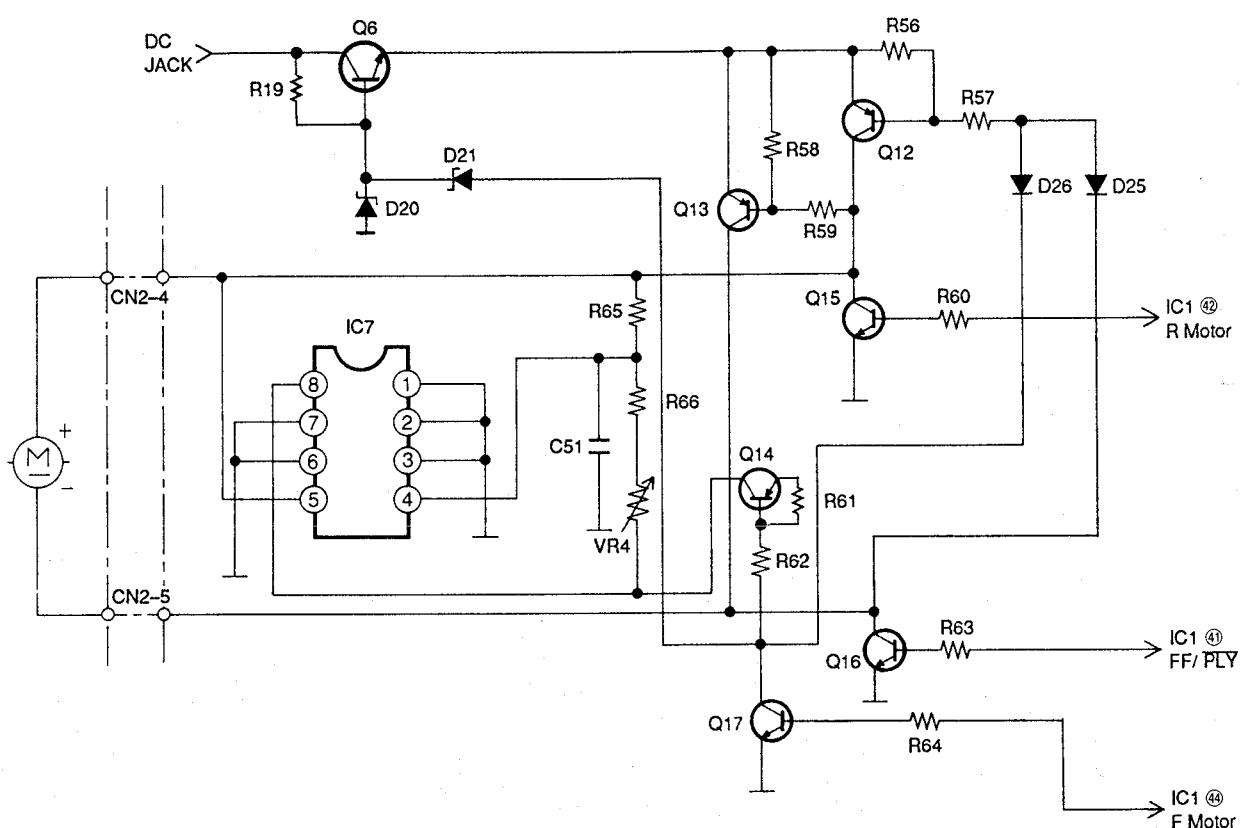
Fast Forward

IC1 pin 44 and 41 become "H" → Q16 → Q17 ON → Q12 ON, and the motor current flows through Q12 → Motor → Q16 and the motor is rotated at high speed.

Rewind

When IC1 pin 42 becomes "H" Q15 goes ON. Q13 also goes on, and the motor current flows through Q13 → Motor → Q15. Because this is the reverse direction to the current which flows in the above Fast Forward mode, the motor rotates at high speed in the reverse direction.

Circuit Diagram



■ MONITOR

Circuit Operation:

The monitor signal flows as follows:

R50 → C31 → pin 20 of IC2 → pin 16 of IC2 → C46 → B78 → pin 15 of IC2 → pin 7 of IC2 → C41 → SPEAKER

A beep signal is heard through the speaker at all times except when the recorded tape is being played back.

Beep tone: Pin 9 of IC1 → C35 → BZ1 → pin 15 of IC2 → pin 7 of IC2 → C41 → SPEAKER

■ PLAYBACK CIRCUIT (OGM and ICM MESSAGE)

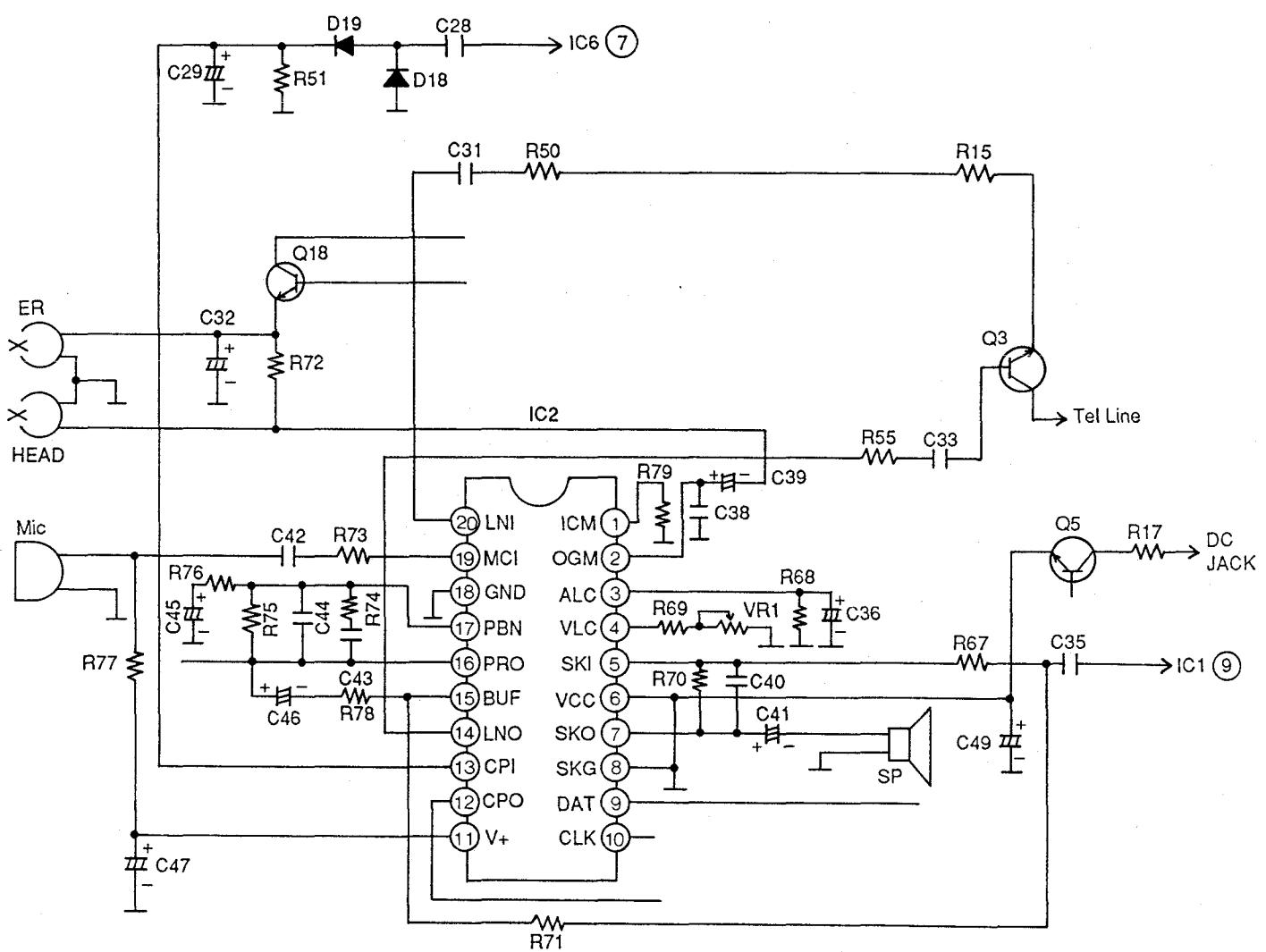
Circuit Operation:

Playback signal flows as following:

Head → C39 → pin 2 of IC2 → pin 16 of IC2 → C46 → B78 → pin 15 of IC2 → pin 7 of IC2 → C41 → SPEAKER

Speaker output level are controlled by VB1

Circuit Diagram



■ CPC (CALLING PARTY CONTROL) DETECTOR CIRCUIT

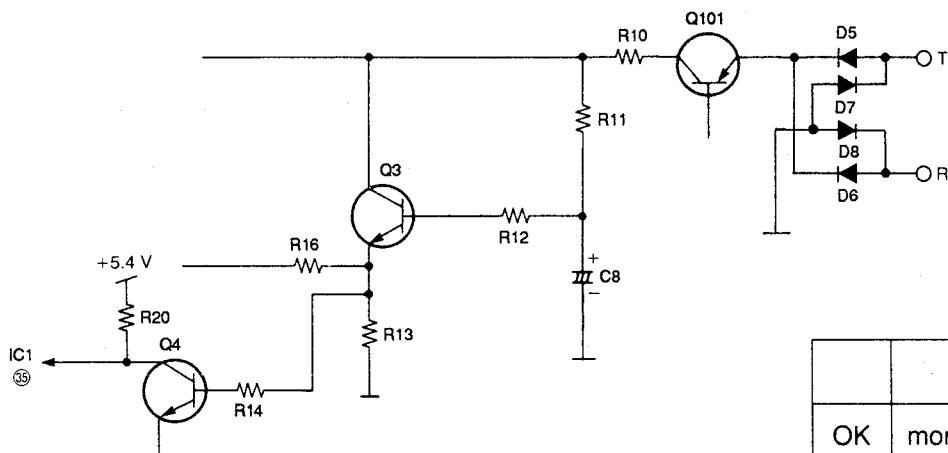
Function:

The CPC DETECTOR complements the units shut off, in the ANSWER mode, after the caller hangs up. At this time, the CPC DETECTOR takes over. The CPC DETECTOR senses the temporary disconnection of the telephone line which occurs after the caller hangs up.

Circuit Operation:

When the unit seizes a line, current will flow through D5-D8, Q101, R10, Q3 and R13. Also as a result, voltage will be applied across R13 causing current to flow to the base of Q4 via R14. As a result, IC1 pin 35 will go LOW. If then the line is momentarily cut, line current will cease to flow, and voltage will no longer be applied across R13, thus Q4 will turn OFF, and IC1 pin 35 will go HIGH, hence this condition will be detected.

Circuit Diagram



CPC Switch (S8)

	A	B
OK	more than 8 ms	more than 600 ms
NG	less than 5 ms	less than 350 ms

■ VOX CIRCUIT

Function:

The vox circuit is designed to detect cyclic signals in which the signal is ON for 100 msec. to 1 sec, continuous sounds and no-sound at all.

After detection, the CPU issues an instruction that makes VOX operation possible.

This means that when a telephone call has ended, the phone is reset and is ready to receive the next call.

Circuit Operation:

A signal output from terminal pin 16 of IC2 passes through C26, R48, then it is amplified and rectified by C29, R51, D18 and D19. Then it is inputted to the comparator which consists of pin 13 of IC2. The output from pin 12 of IC2 is inputted to pin 14 of CPU(IC1). When sound is present, the output at pin 12 of IC2 becomes a low level, while with no-sound its output becomes a high level.

Circuit Diagram See page 24.

■ OGM END DETECTOR CIRCUIT

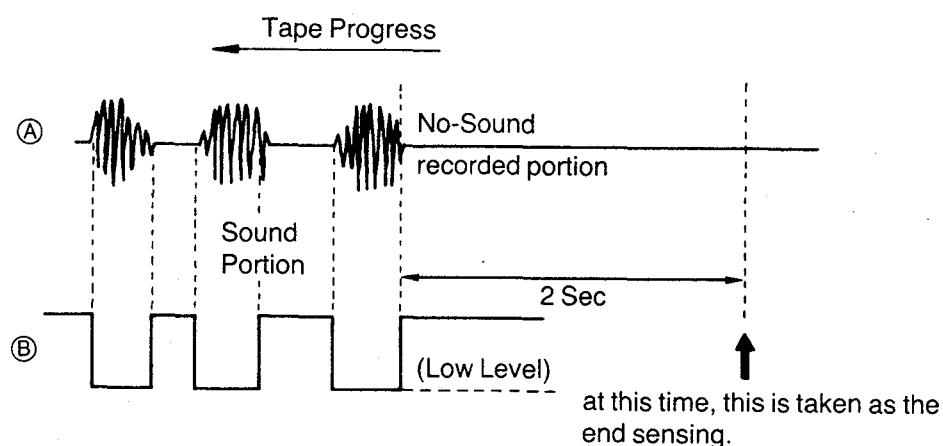
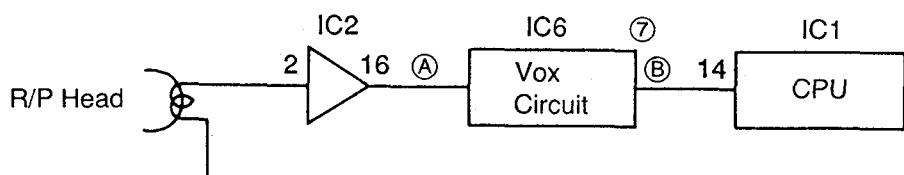
Circuit Operation:

When the OGM Button is pressed upon completion of the OGM recording, no sound signals are recorded on the tape, the tape sound track continues to the end and stopped.

A no-sound detection system is used during playback. If a no-sound condition exists for 2 seconds, the unit will sense it as the end of the OGM tape. The no-sound detection is composed by the vox circuit. (IC2 pin 12; sound output...a low level, no-sound...a high level)

The sensing tape detection system is judged by pin 14 of IC1.

Circuit Diagram



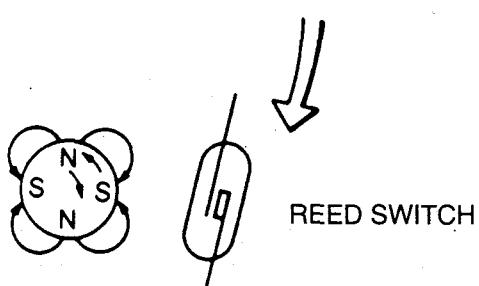
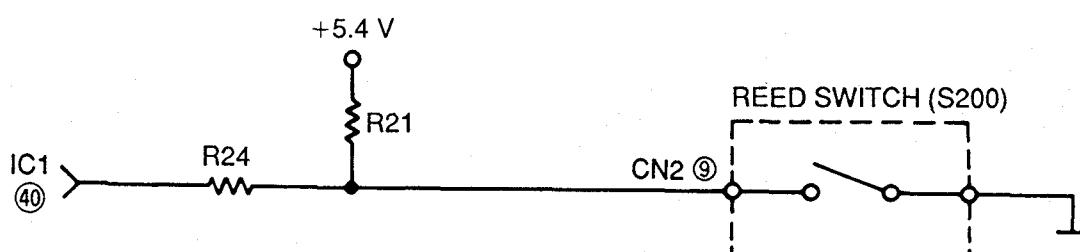
■ ICM TAPE ROTATION DETECTOR CIRCUIT

Circuit Operation:

The changes in the direction of the magnetic field caused by the rotation of the four-pole ferrite magnet are detected by the Reed Switch; this output is to the microcomputer input.

Reed Switch → R24 → IC1 pin 40

Circuit Diagram



■ RING DETECTOR CIRCUIT

Function:

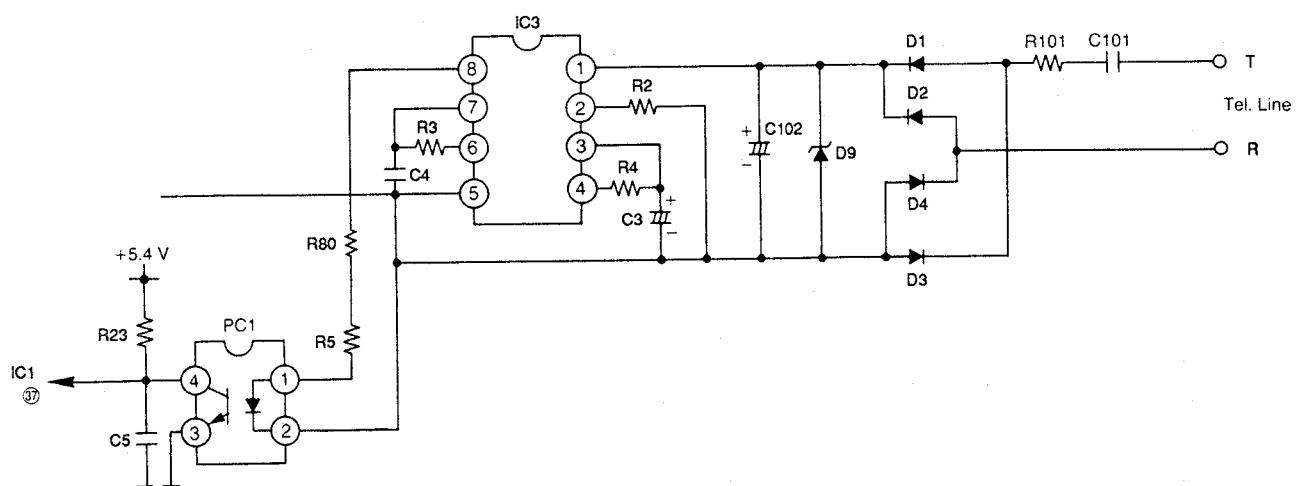
This circuit activates the CPU to respond to the ring signal from the telephone line during the ANSWER mode of operation.

Circuit Operation:

When a ring signal is inputted from the telephone line, a tone (ring signal) will be outputted from IC3 pin 8. (See telephone line interface.)

The signal flows through R80→R5→PC1 ①→PC1 ②, hence photocoupler PC1 ④→③ will turn ON. As a result, IC1 37 goes Low, indicating that Ring Signal was input.

Circuit Diagram



■ RECORD CIRCUIT (OGM and ICM)

Circuit Operation:

(Recording Signals)

Recording input signals from the telephone line or MIC is selected by pin 9 of IC2.

The signal from the telephone line flows from Q3 through R50, then passes through C31, and pin 20 of IC2.

The signal of the built-in condenser microphone goes to pin 19 of IC2 via C42 and R73.

The selected input signals are amplified an amplifier in IC2. Then go to pin 16 of IC2 → C46 → R78 → pin 15 of IC2 → pin 2 of IC2 → C39 → Head.

The other output goes to the MONITOR CIRCUIT.

The all circuit are consists of R68 and C36.

(Signal)

The beep tone generated by IC1.

The beep tone of the ICM recording (from pin 9 of IC1) is processed to the ICM recording head via C35 → R71 → pin 15 of IC2 → pin 2 of IC2 → C39 → Head.

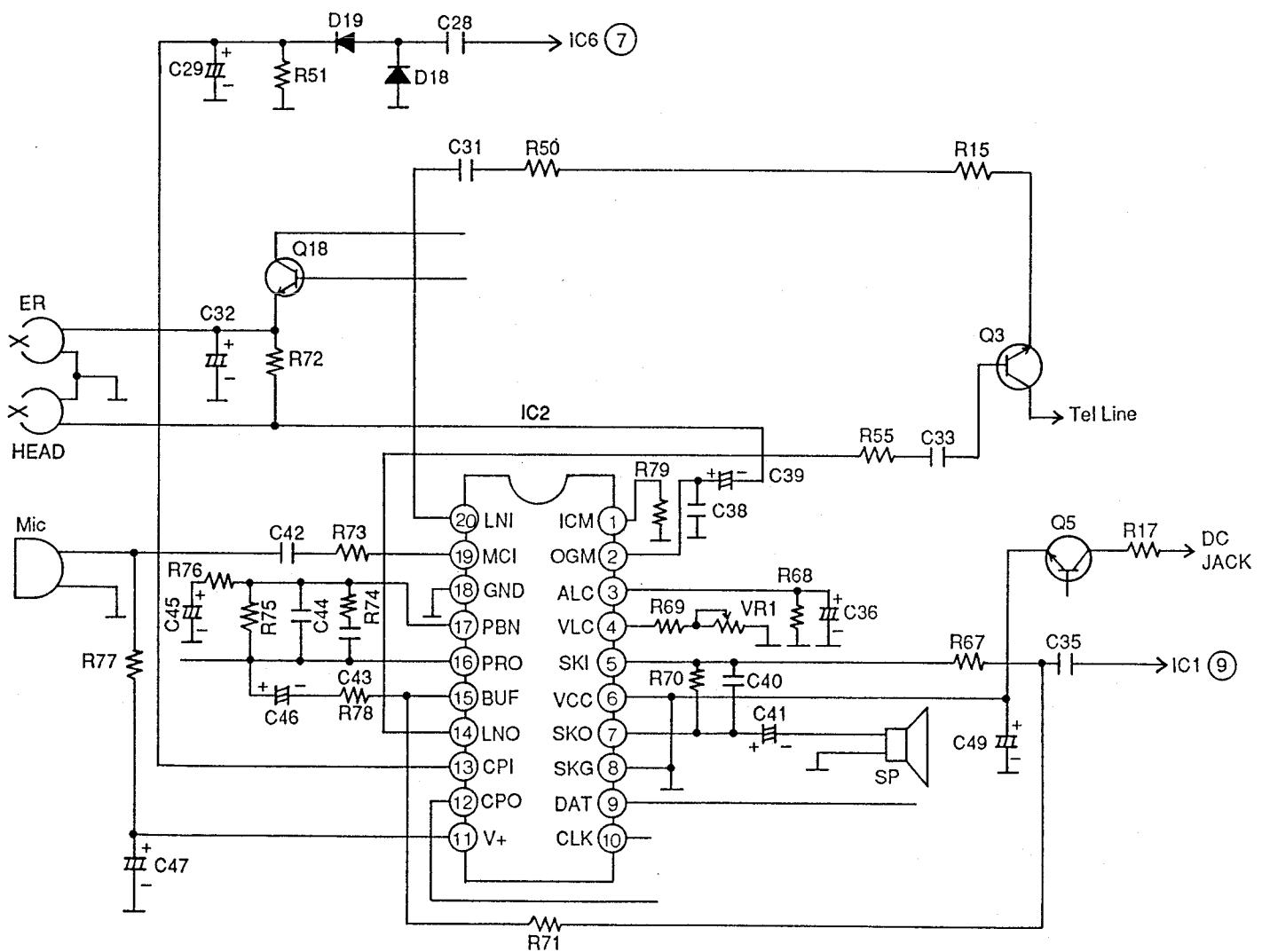
(Erase)

When in the Rec mode, pin 11 of IC1 is High.

The voltage is applied to the Erase Head, thus the Erase Head is activated.

The bias current is applied the R/P Head via R72.

Circuit Diagram



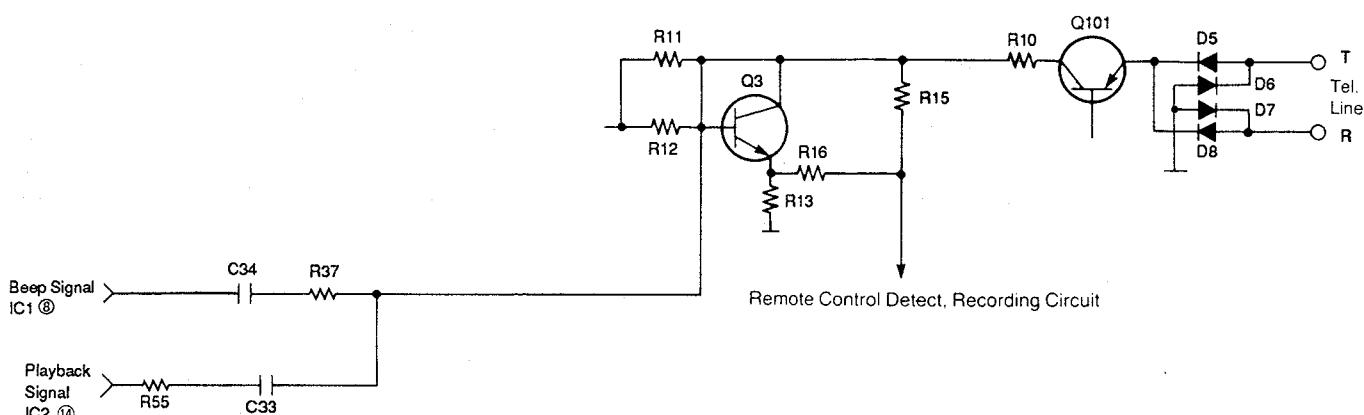
■ LINE OUTPUT CIRCUIT

Circuit Operation:

Each signals are sent to the telephone line as follows.

- (Beep Tone) pin 8 of IC1 → C34 → R37 → base of Q3 → collector of Q3 → Q101 → D5~8 → Telephone Line.
- (Tape Playback signal) Head → C39 → pin 2 of IC2 → pin 16 of IC2 → C46 → R78 → pin 15 of IC2 → pin 14 of IC2 → R55 → C33 → base of Q3 → collector of Q3 → Q101 → D5~8 → Telephone Line.

Circuit Diagram



■ POWER SUPPLY CIRCUIT

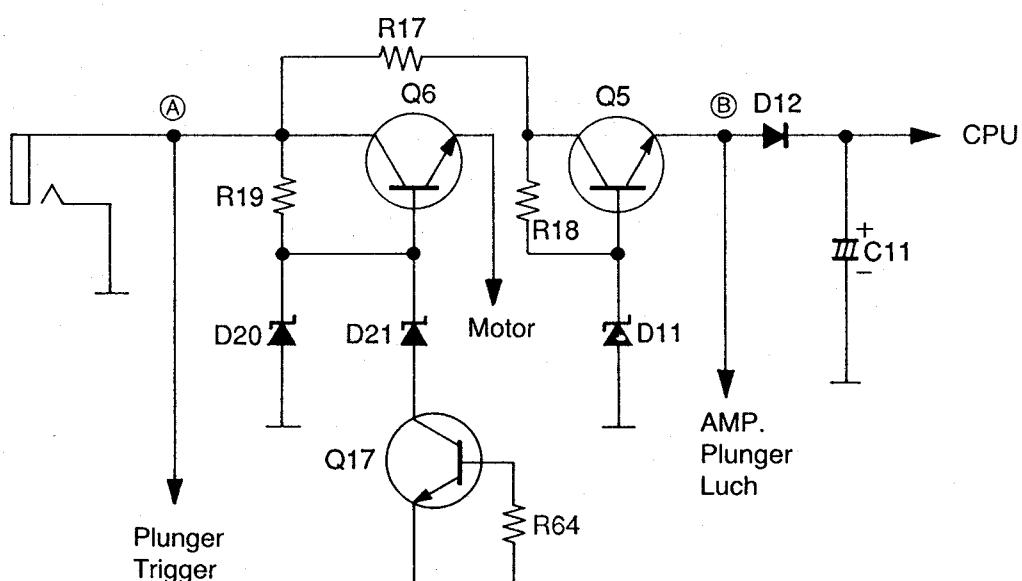
Function:

Power from the AC adapter Passes through the 2-stage regulating block consisting of Q5, and provided system voltages of 6 v and 5.4 V.

Circuit Operation:

Power from the AC Adapter is supplied directly to the plunger trigger (A). Q5 is the second stage regulated power supply. The voltage at point B is regulated to 6 V by the 6.8 V zener voltage of D11. The 6 V voltage is shifted by D12 to 5.4 V which is used to power the CPU, etc.

Circuit Diagram



■ IC2 (PQVISC79100P)

The IC2 (PQVISC79100P) is REC/PLAY AMP for TAM.
Data is entered serially through pin 9 and pin 10.

The data whether pin 9 is HIGH or LOW when signals to pin 10 go HIGH are read into the internal register.
The register is reset when signals to pin 10 go HIGH and pin 9 becomes HIGH (as shown in Fig. b).

The internal block diagram is shown in Fig. c.

The logic of each switch is shown in Fig. d.

The input signals on each operation are shown in Fig. a.

	A	B	C	D	E	F	G	H
PLAY	L	L	H	L	L	L	H	L
OGM REC	H	L	H	H	H	L	L	L
LINE REC	L	H	H	H	H	L	H	L
LINE OUT	L	L	H	L	L	H	L	L

Fig. a

Example of data input

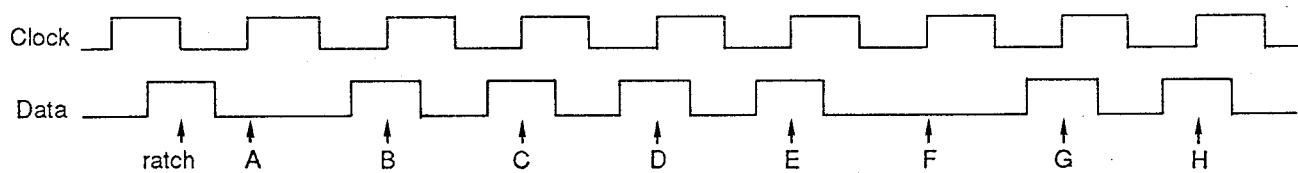


Fig. b

	A	B	C	D	E		F	G	H
H	Mic Amp on	Line Amp on	Pre Out on	ALC on	Rec Amp on	PB Amp off	Lout AMP on	ATT (Power Amp) on	ICM on
L	Mic Amp off	Line Amp off	Pre Out off	ALC off	Rec Amp off	PB Amp on	Lout AMP off	ATT (Power Amp) off	OGM on

Fig. c

IC2 BLOCK DIAGRAM

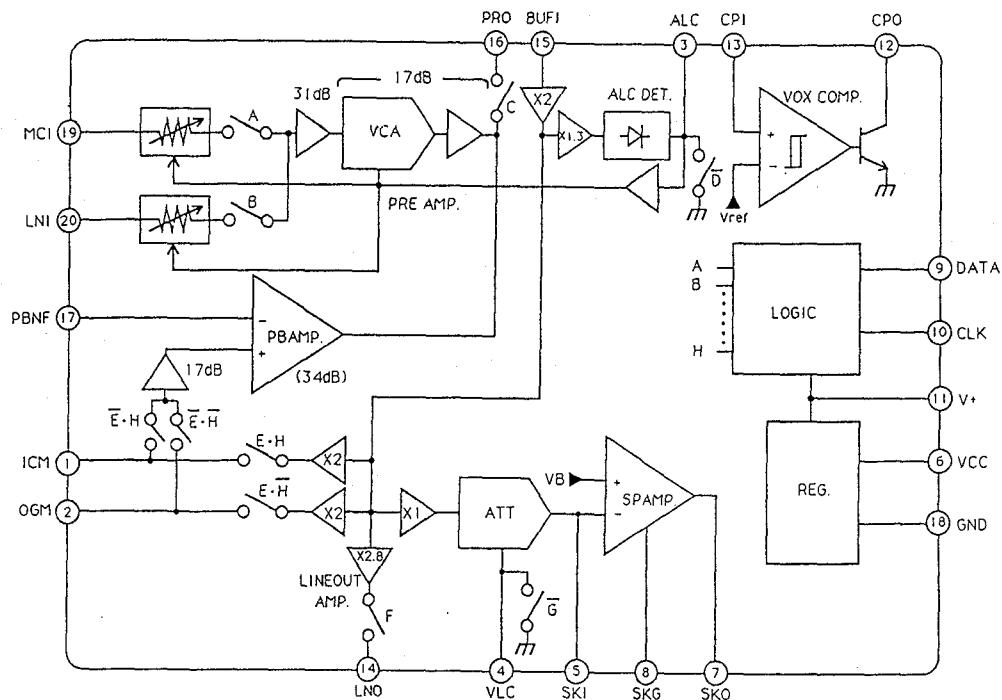
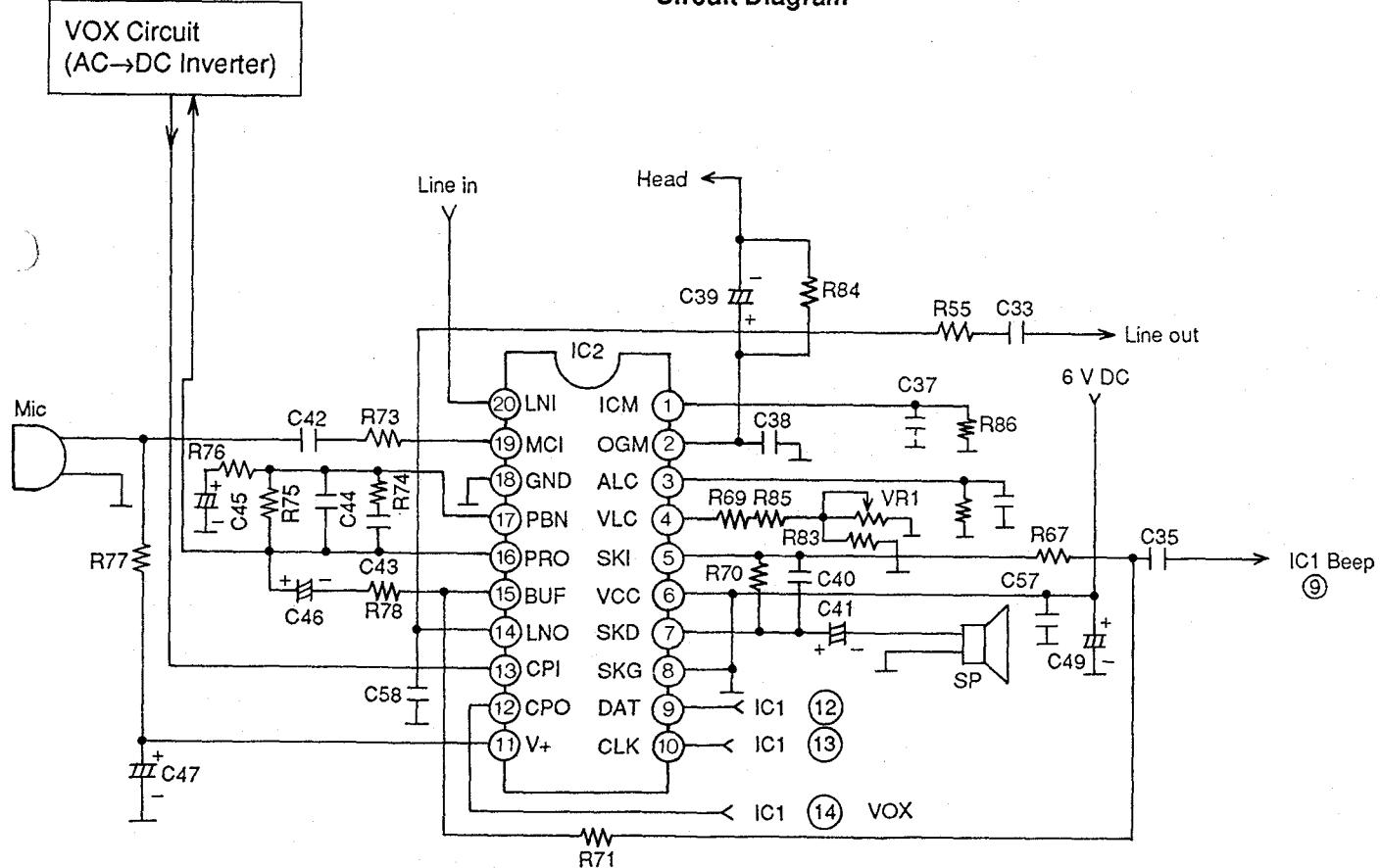


Fig. d

Circuit Diagram



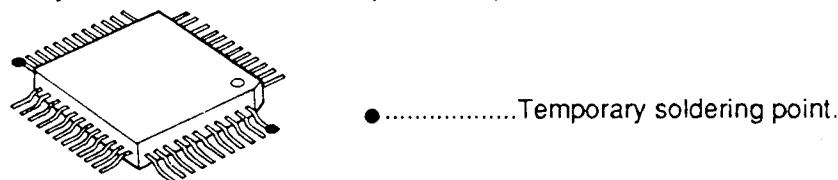
HOW TO REPLACE FLAT PACKAGE IC

■ PREPARATION

- SOLDER Sparkle Solder 115A-1, 115B-1
OR
Almit Solder KR-19, KR-19RMA
- Soldering iron Recomended power consumption will be between 30w to 40w.
Temperature of Copper Rod $662 \pm 50^\circ F$ ($350 \pm 10^\circ C$)
(An expert may handle 60~80w iron, but beginner might damage foil by overheating)
- Flux HI115 Specific gravity 0.863
(Original flux will be replaced daily.)

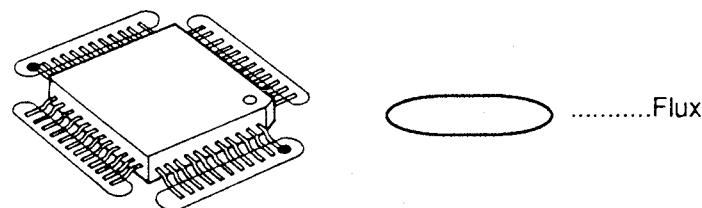
■ PROCEDURE

1. Temporary fix FLAT PACKAGE IC by Soldering on marked 2pins.

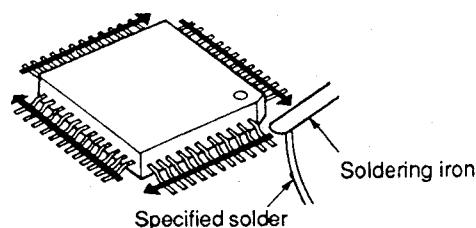


*Most important matter is accurate setting of IC to the corresponding soldering foil.

2. Apply flux for all pins of FLAT PACKAGE IC.

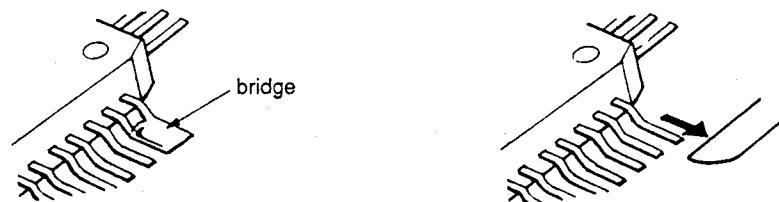


3. Solder employing specified solder to direction arrow, as slide the soldering iron.



■ MODIFICATION PROCEDURE OF BRIDGE

1. Re-solder slightly on bridging portion.
2. Remove remained solder along pins employing soldering iron as shown in below Figure.



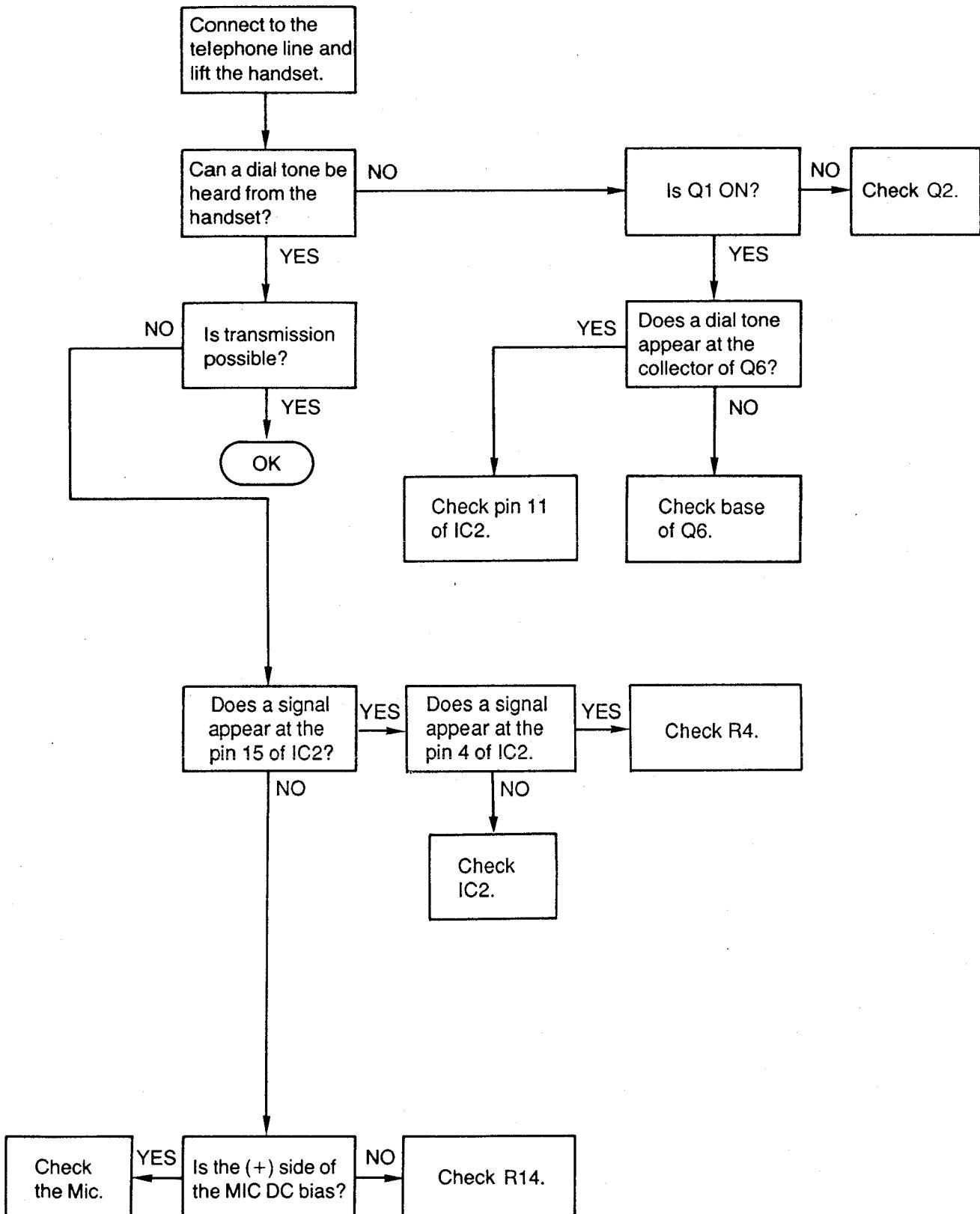
TROUBLE SHOOTING GUIDE

1) Service Hints

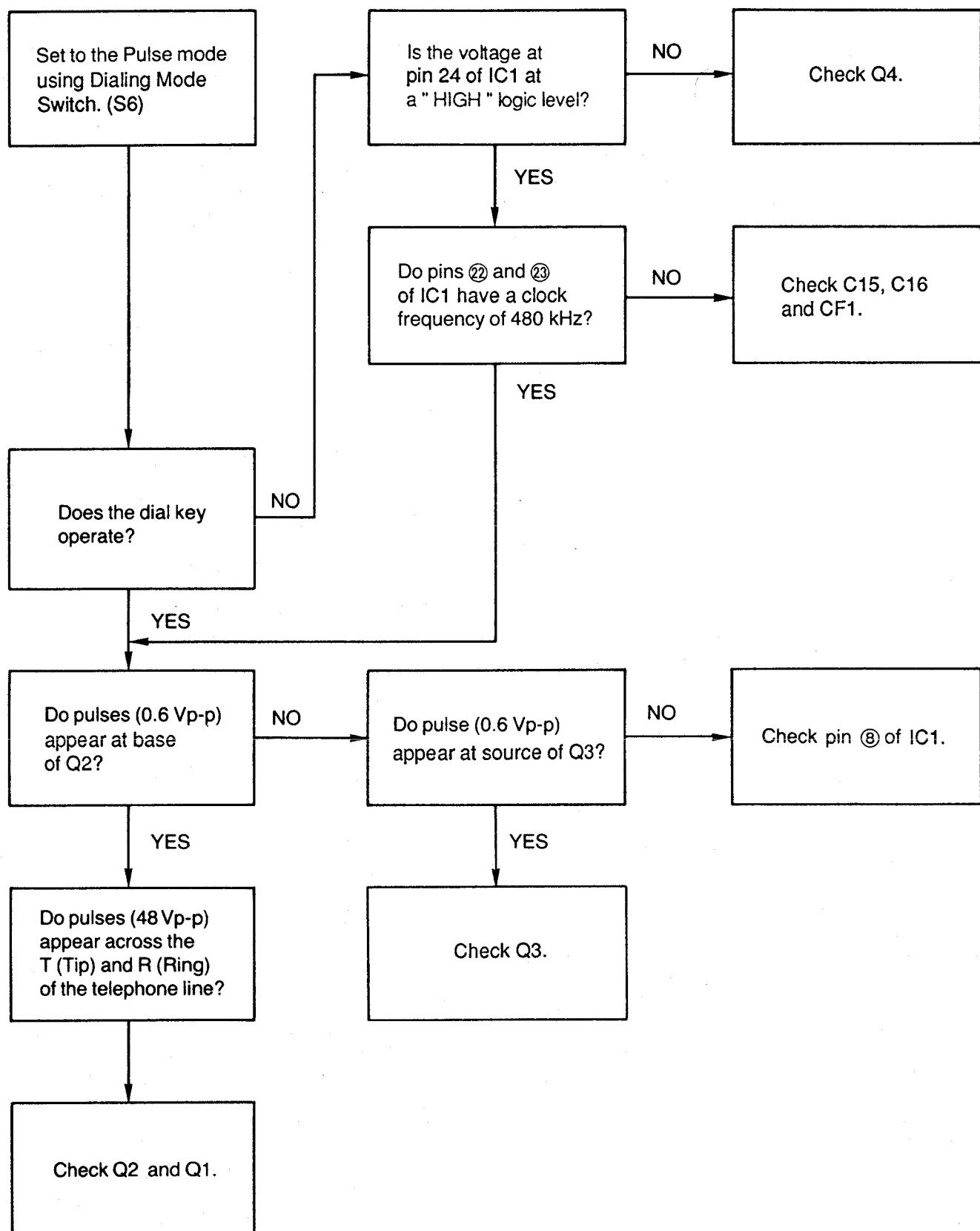
SYMPTOM	CURE
Does not rings.	Replace Ceramic Buzzer or IC3.
Answering Machine rings, when no one calls.	Check pin 3 and 4 of PC1 for short.
ICM will not cut off.	Chenge C26 from $0.042\mu\text{F}$ to $0.033\mu\text{F}$ or $0.022\mu\text{F}$.
OGM recording distorted.	Check for cold solder joints on IC1.
No PWR/ AFTER PWR fixed no plunger a activation.	Check R34, Q10 and Q9.
Intermittent rewind.	Check AC Adaptor or R21 or R24.
Would not record all OGM.	Check C39.
No OGM.	Check IC1 and IC2.
Can dial out but incoming calls get busy signal.	Check Q1 and SA1.
Holds line constantly.	Check Q1.

■ INTEGRATED TELEPHONE SYSTEM SECTION (For Handset)

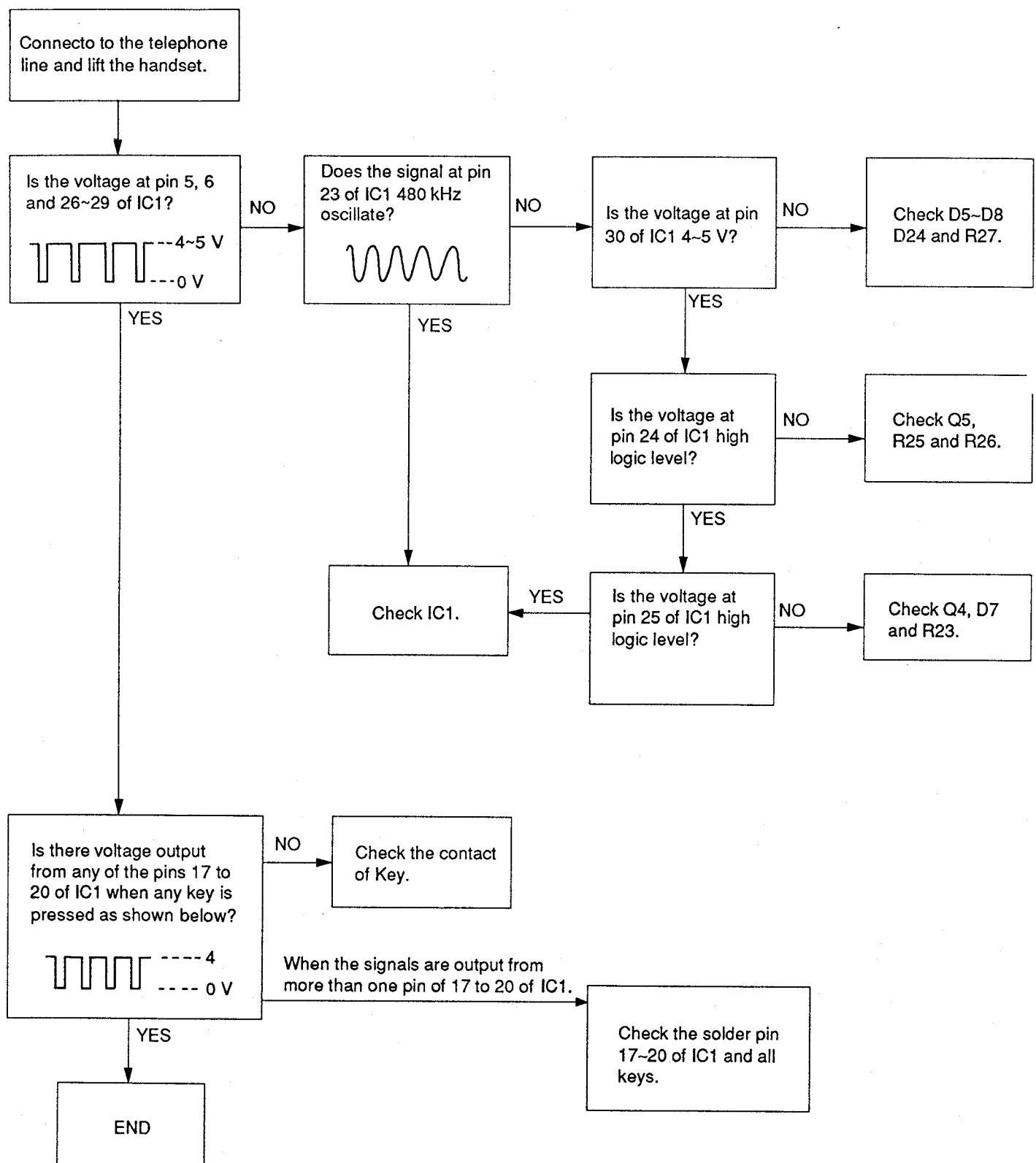
2) Transmission Problems



3) Pulse Dialing Problems

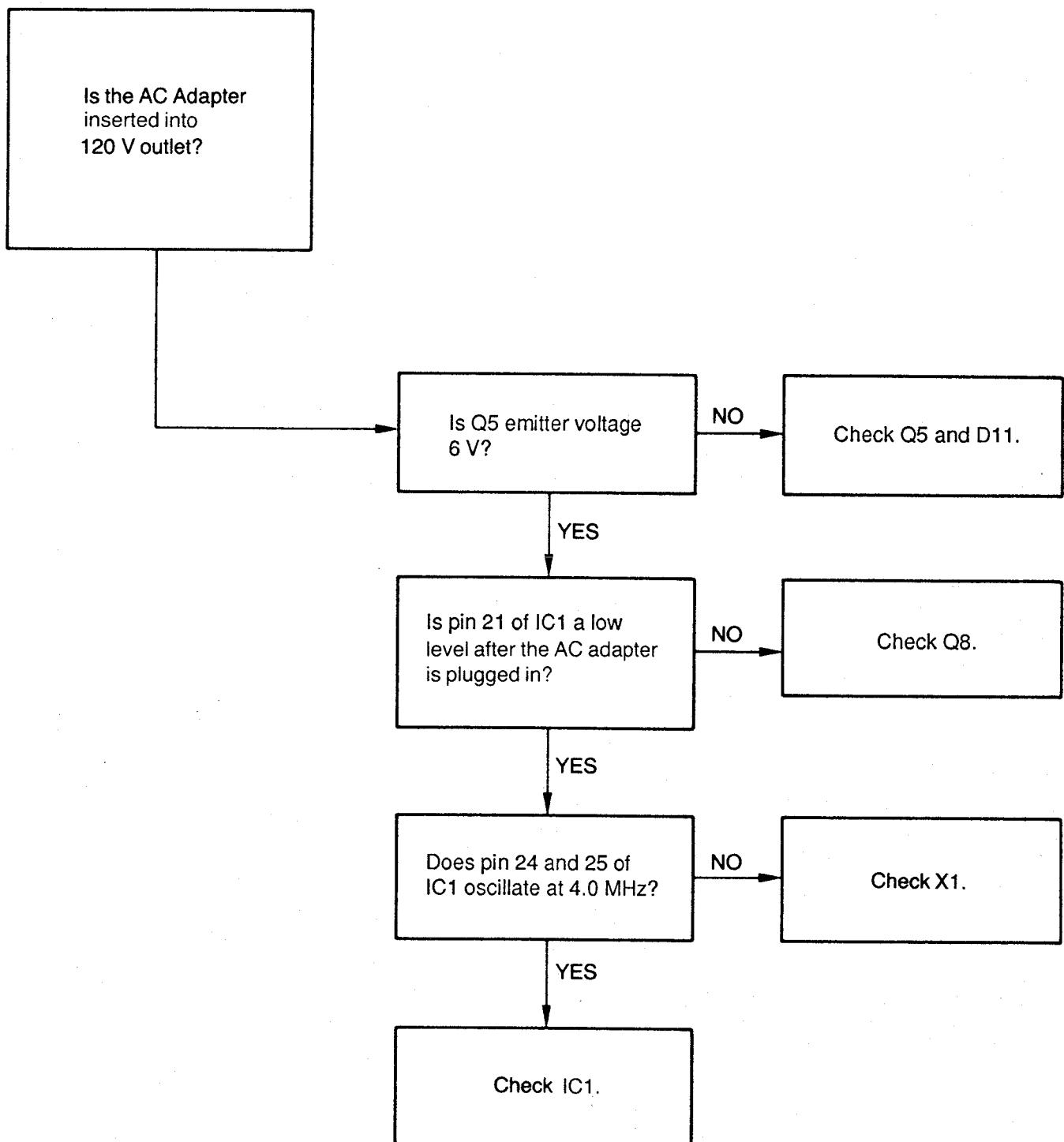


4) How to check the key scan I/O (IC1)

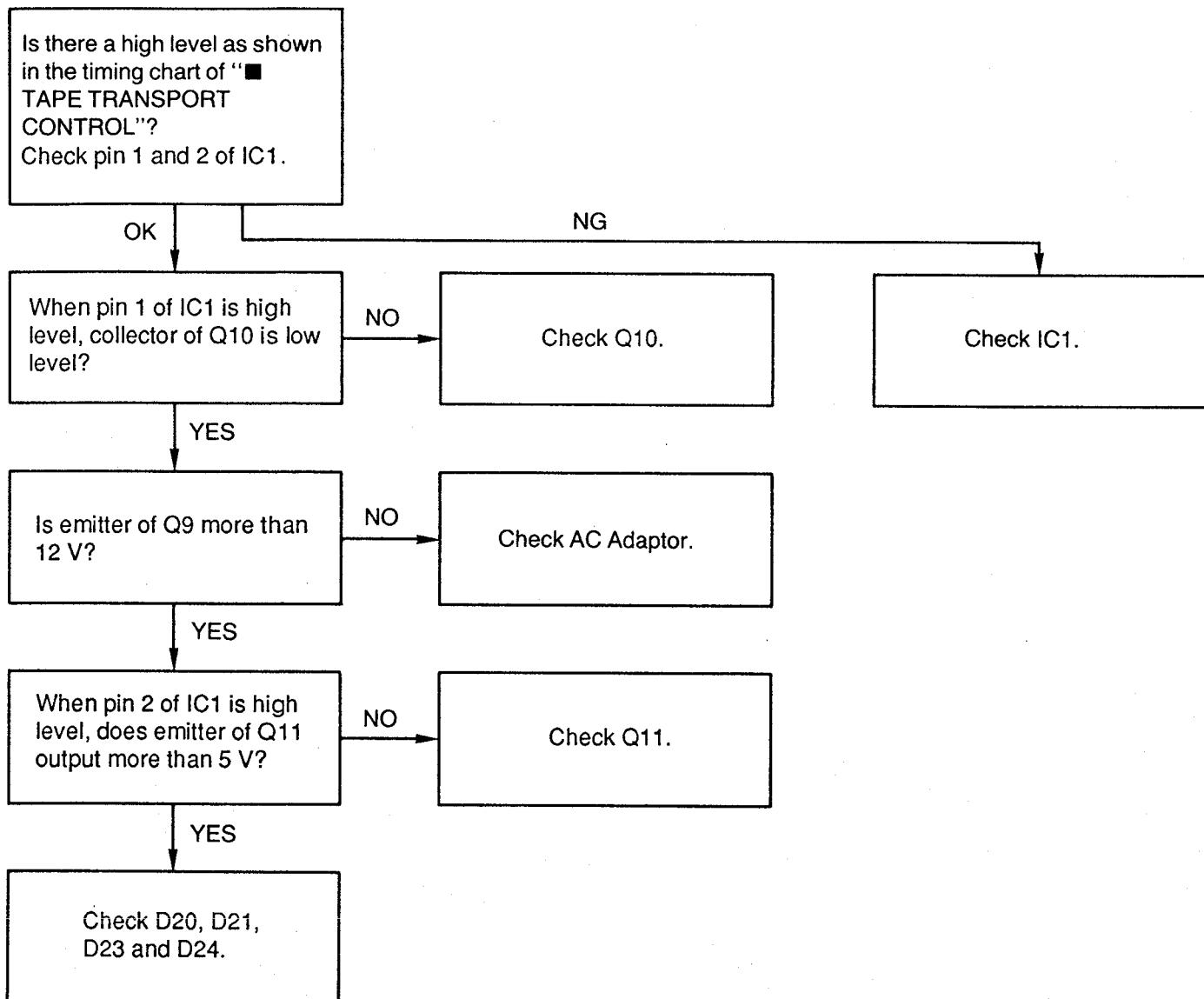


■ AUTOMATIC TELEPHONE ANSWRING SYSTEM (For Cradle)

1) NO FUNCTIONS OPERATE



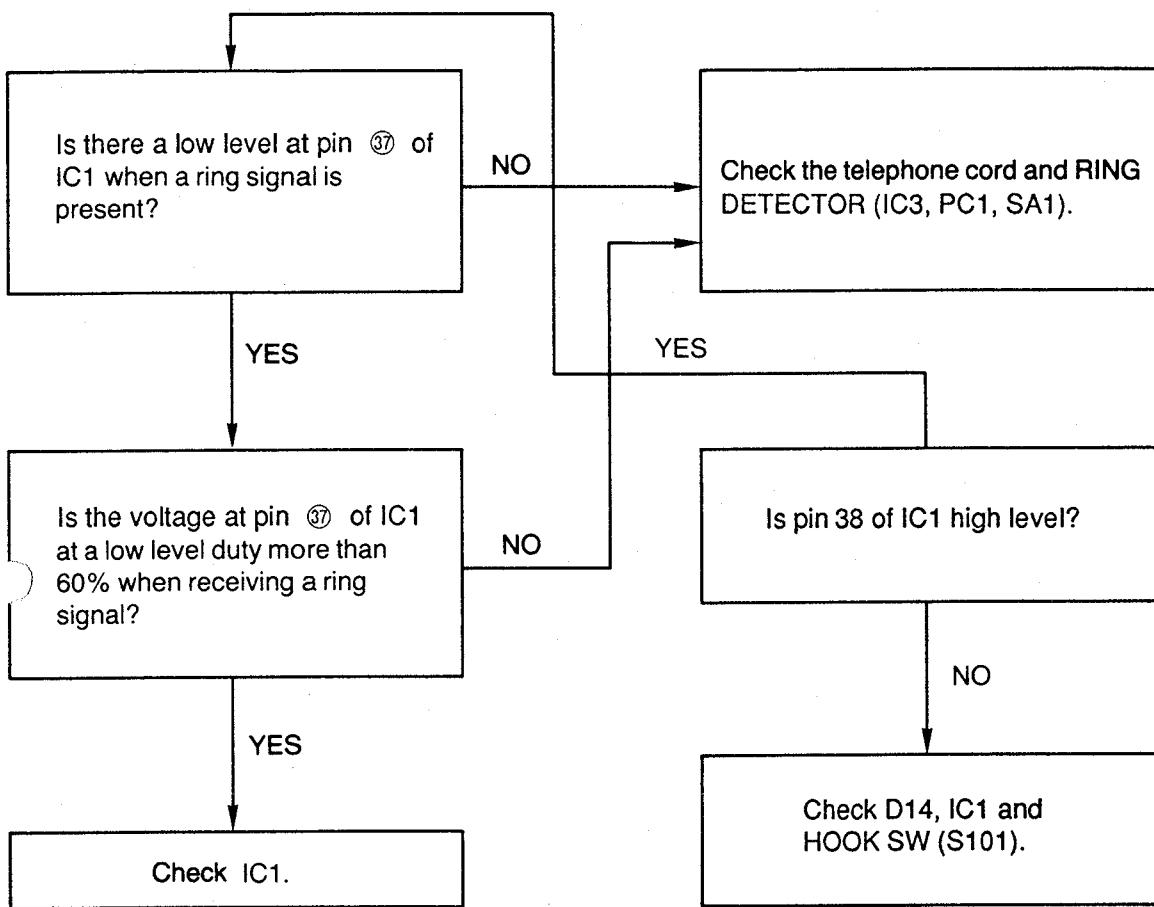
2) THE PULL OF PLUNGER IS POOR OR NOT AT ALL



3) OGM END MARK DETECTOR

Check IC1, pin 12 and 13 of IC2 and IC6.

4) DOES NOT ANSWER TELEPHONE CALL



5) •ICM CONTINUES TO RECORD AFTER CALLER HANGS UP.

•END OF MESSAGE CLIPPED WHEN CALLER HANGS UP.

When caller hangs up, the KX-T2388 can detect the following 4 signal type.

- A. CPC pulse.
- B. Dial tone or other continuous tones.
- C. Silence.
- D. Cyclic signals.

A. Check CPC DETECTOR CIRCUIT (Q4, R14, R20)

B., C., D.

Check VOX DETECTOR CIRCUIT (R47, R48, R51, C26, C27, C28, C29, D18, D19, IC2, IC6, IC3).

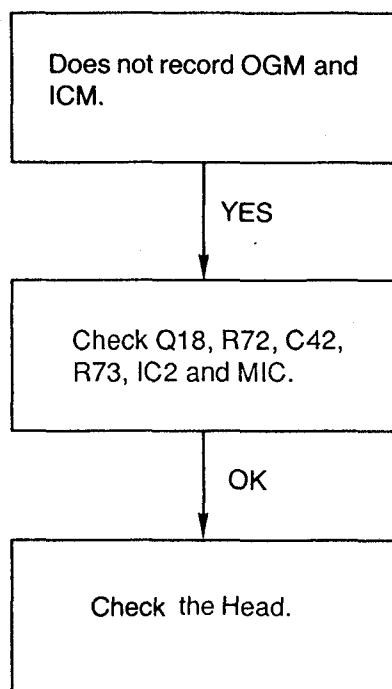
6) REMOTE CONTROLLER DOES NOT WORK/RESPONSE IS POOR.

The following are considered for the causes of no remote reception:

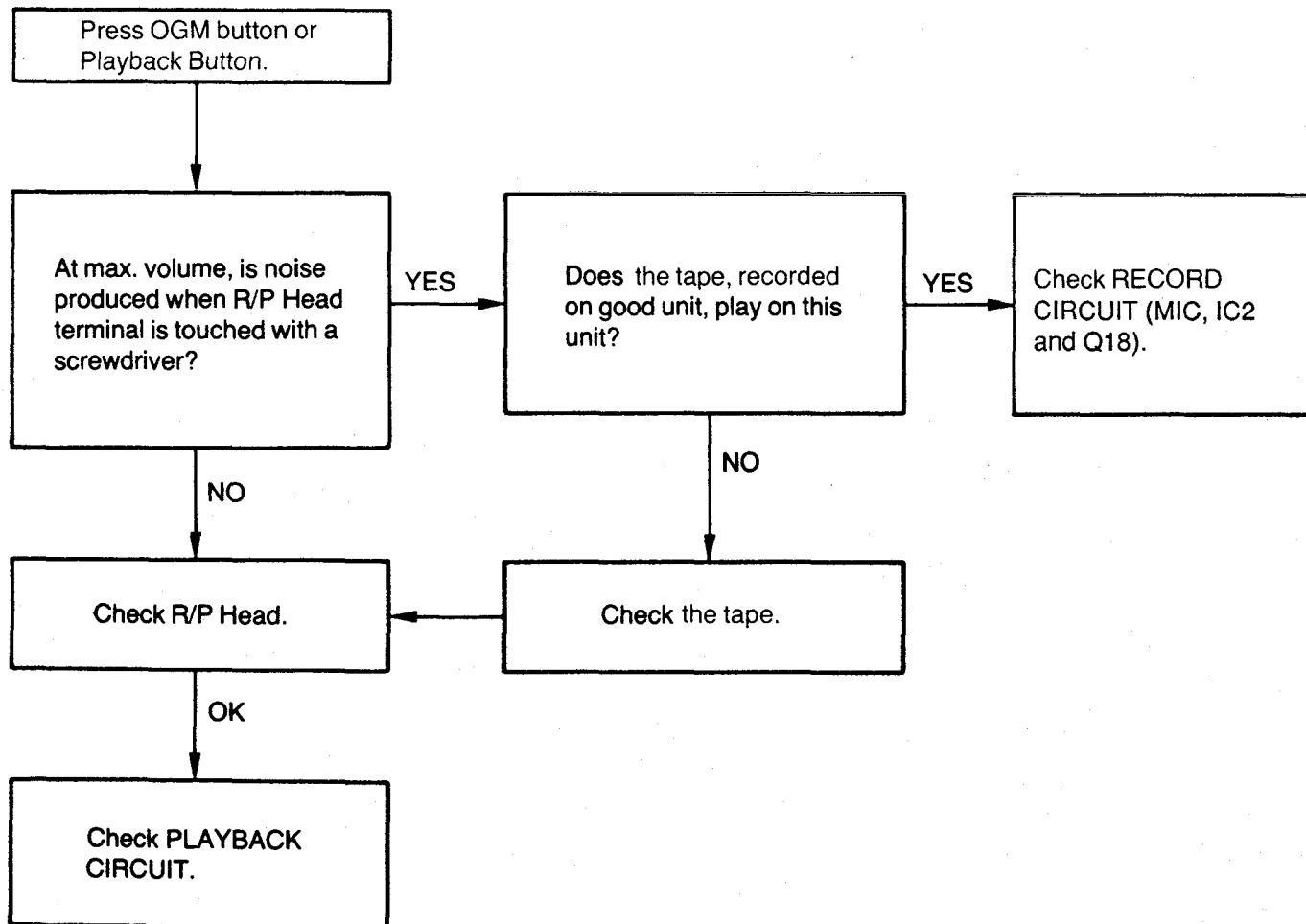
- A. Does the security code of the unit fit in with the input code from the telephone line?
- B. High distortion in LINE OUTPUT CIRCUIT causing interference between transmitting signal and remote signal.
- C. Excessive loss in telephone line.
- D. Remote Control Detective Circuit...defective frequency adjustment.

- A. Check the security code of the unit.
- B. Check LINE OUTPUT CIRCUIT (Q3, R15, R16 and D10)
- C. Test on telephone line known to be working properly.
- D. Adjust VR2 and VR3 (Refer to page 8).

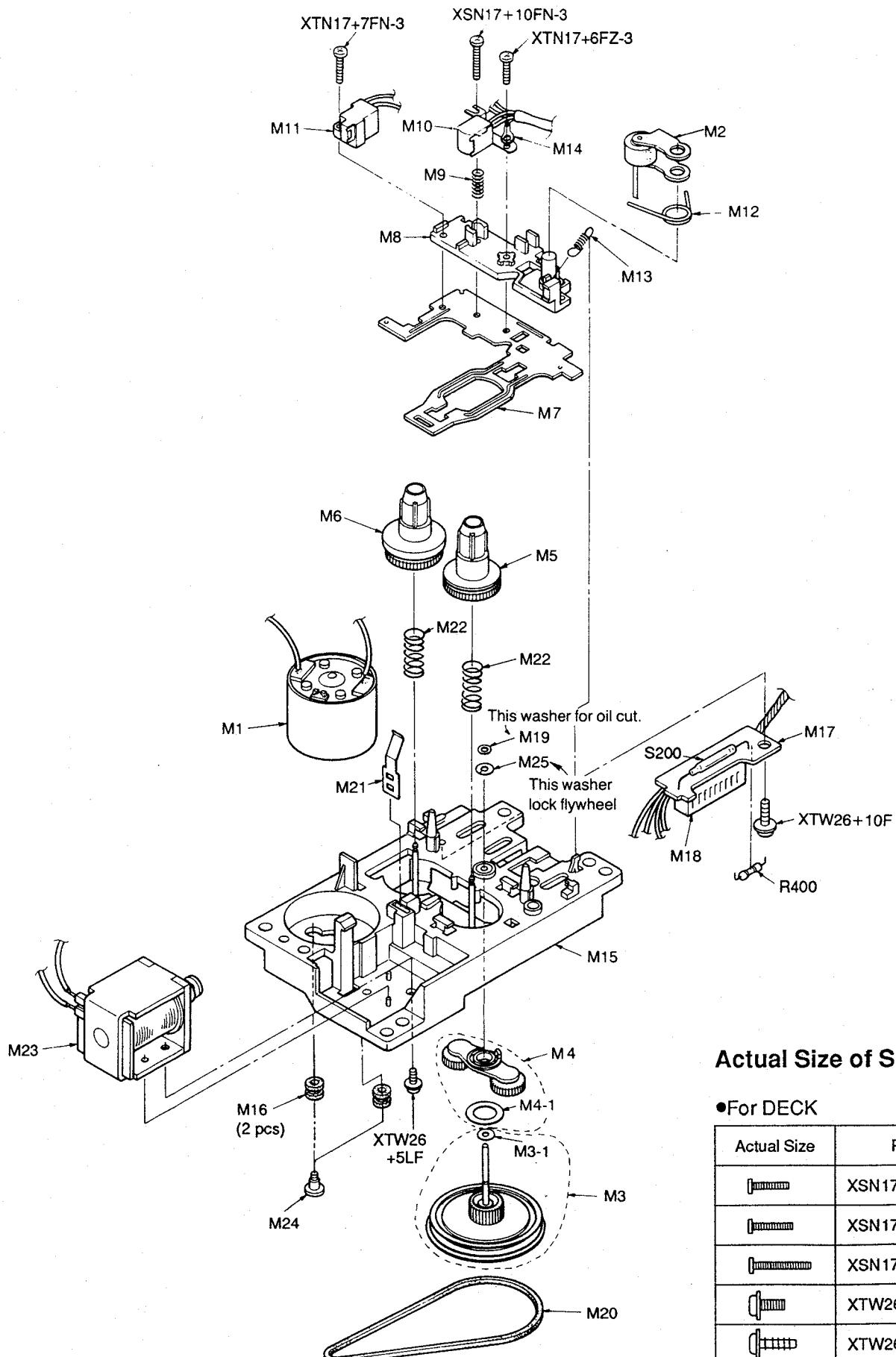
7) DOES NOT RECORD



8) NO OR LOW OGM PLAYBACK



CASSETTE DECK PARTS LOCATION



Actual Size of Screws

•For DECK

Actual Size	Part No.
	XSN17+6FZ-3
	XSN17+7FN-3
	XSN17+10FN-3
	XTW26+5LF-A
	XTW26+6F

Fig. 16

CABINET & ELECTRICAL PARTS LOCATION

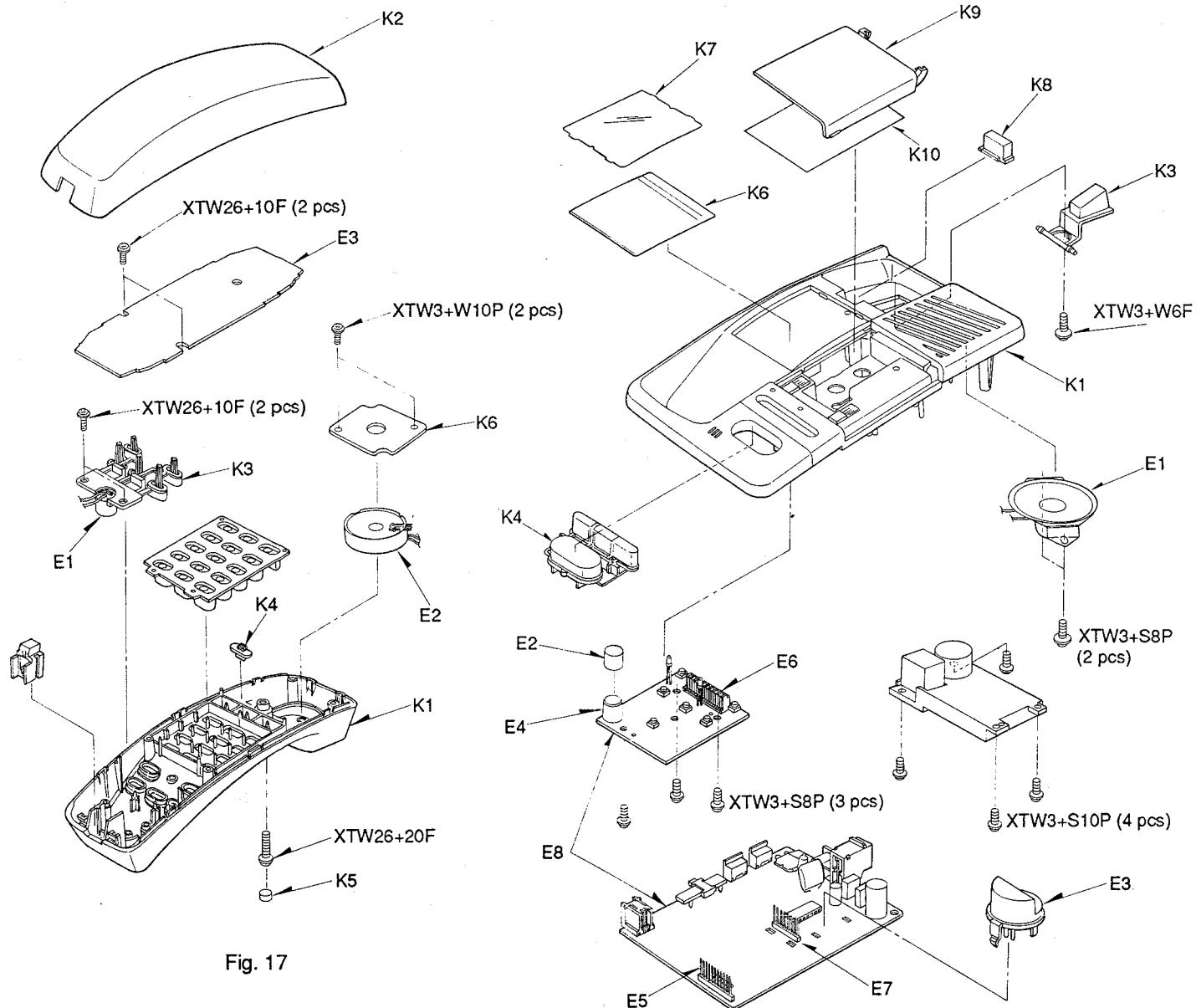


Fig. 17

Actual Size of Screws

•For Unit

Part No.	Actual Size
XTW3+S10P	
XTW3+W10P	
XTW26+10F	
XTW26+20F	

Part No.	Actual Size
XTW3+W6F	
XTW3+S8P	
XTW3+S14P	

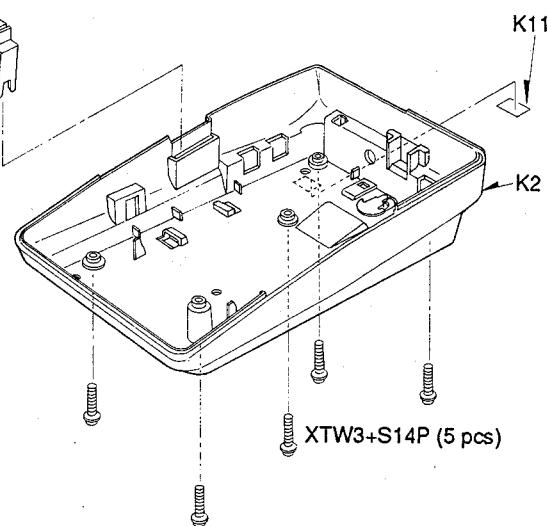


Fig. 18

ACCESSORIES & PACKING MATERIALS

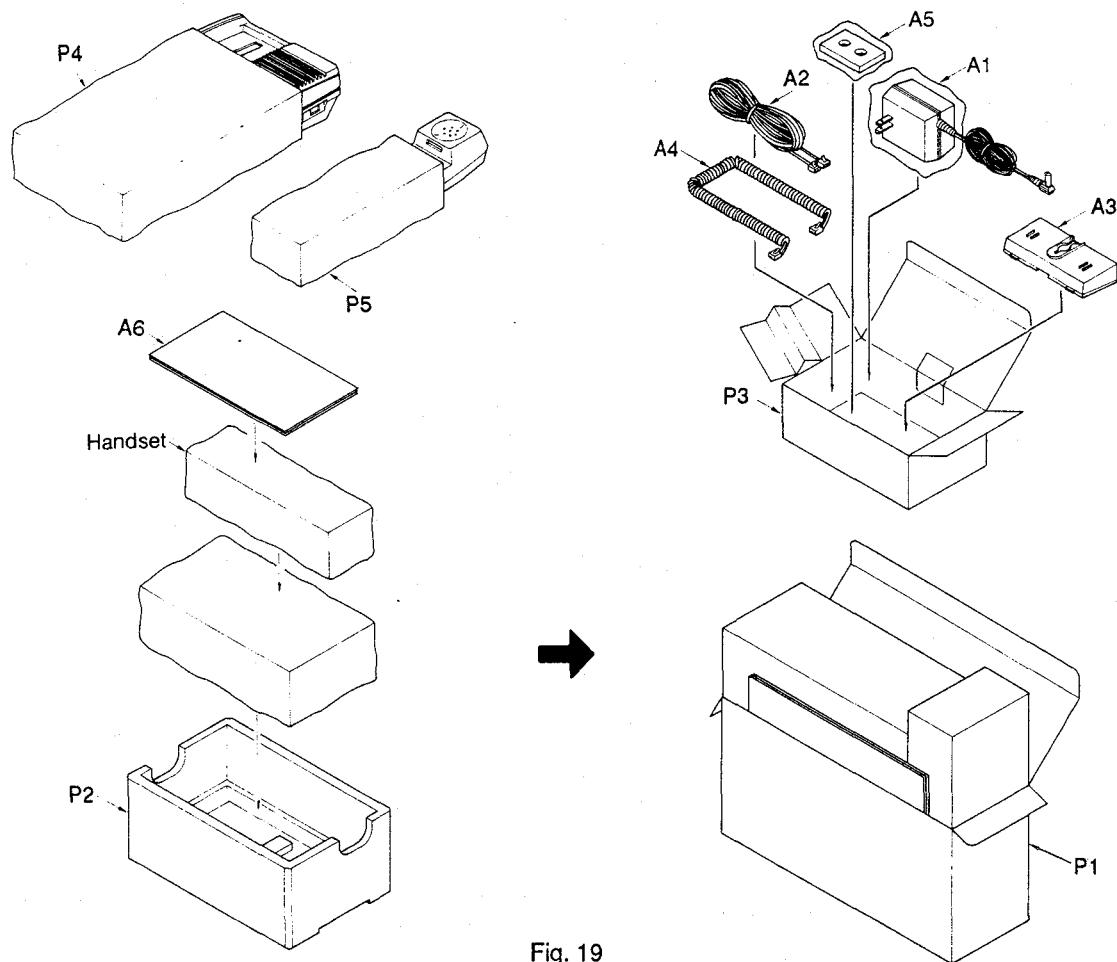


Fig. 19

EXTENSION CORD CONNECTING METHOD

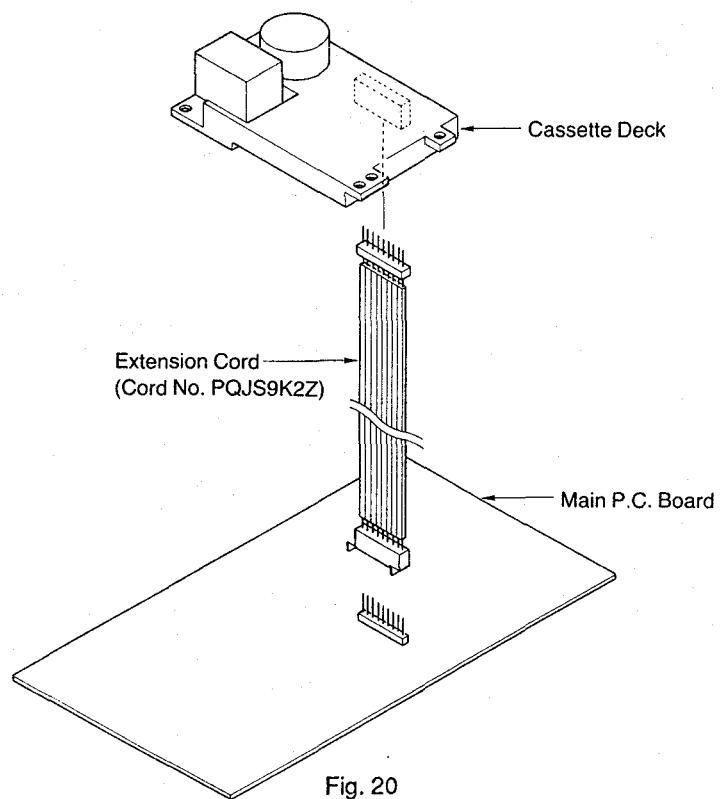


Fig. 20

REPLACEMENT PARTS LIST

Handset for Model KX-T2388

Notes:
1. Printed circuit board assembly with mark (NLA) is no longer available after production discontinuation of the complete set.

2. Important safety notice.
Components identified by the Δ mark special characteristics important for safety.
when replacing any of these components, use only manufacturer's specified parts.

3. The S mark indicates service standard parts and may differ from production parts.

4. RESISTORS & CAPACITORS

Unless otherwise specified.

All resistors are in ohms(Ω) $k=1000\Omega, M=1000k\Omega$

All capacitors are in MICRO FARADS(μF) $P=\mu\mu F$

*Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	ERDS,PQRD:Carbon
ERD:Carbon	ERG:Metal Oxide	PQRQ:Fusible Resistor
RRD:Chip	ERO:Metal Film	PQ4R:Chip

Wattage

10,16,18:1/8W 14,25,S2:1/4W 12,50,S1:1/2W 1:1W 2:2W 3:3W

*Type & Voltage of Capacitor

Type

ECCD:Semi-Conductor ECQS:Styrol PQCBX,ECUV,PQCUV:Chip ECMS:Mica	ECCD,ECKD,PQCBX,ECBC : Ceramic ECQM,ECQV,ECQE,ECQG : Polyester ECEA,ECSZ : Electrolytic EECW : Electric Double Layer
--	---

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others		
1H: 50V	05: 50V	OF:3.15V	0J :6.3V	1V :35V	
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V	
2E:250V	2:200V	1V:35V	1C :16V	1J :63V	
2H:500V		OJ:6.3V	1E,25:25V	2A :100V	

Ref. No.	Part No.	Part Name & Description	Pcs
INTEGRATED CIRCUITS, TRANSISTORS & DIODES			

IC1	PQVI451N9968	IC	1
IC2	PQVIBA8215L	IC	1
Q1	2SA1625	TRANSISTOR(SI)	1 Δ
Q2	2SC2240	TRANSISTOR(SI)	1 Δ
Q3	2SK1398	TRANSISTOR(SI)	1
Q4	2SB1218A	TRANSISTOR(SI)	S 1
Q5, 6	2SD1819A	TRANSISTOR(SI)	S 2
D1	MA4180	DIODE(SI)	1 Δ
D2, 4, 10 , 20~23	1SS131	DIODE(SI)	S 7
D3	MA4056	DIODE(SI)	1
D5	PQVDMZJ2R0A	DIODE(SI)	1
D6, 8	MA700A	DIODE(SI)	2
D7	PQVDMZJ2R4B	DIODE(SI)	1
D9	PQVDSLZ135B2	LED	1
D11~14	LN363GPPKU	LED	4
D24	PQVDMZJ5.6A	DIODE(SI)	1

JACK

J1	PQJU1TB2Y	JACK, HANDSET	1
----	-----------	---------------	---

SWITCHES

S1~5	EVQ12405K	SWITCH, REDIAL, PROG., PAUSE etc.	5
S6	PQSS2A04W	SWITCH, DIALING MODE	1
S7~21	PQSE115Z	SWITCH, 12 KEY, DIRECT	1

Ref No.	Part No.	Part Name & Description			Pcs/ Set
CABINET PARTS					
K1	PQKM205Z8	UPPER CABINET			1
K2	PQKF185Z8	LOWER CABINET			1
K3	PQBCX194Z	BUTTON, REDIAL, PROG., PAUSE etc.			1
K4	PQBD165Z	KNOB, DIALING MODE			1
K5	PQHG669S	RUBBER			1
K6	PQUL82Z	WEIGHT			1
K7	PQNW500Z	WASHER			1
ELECTRICAL PARTS					
E1	PQJM115Z	MICROPHONE			1
E2	PQWH2T2388M	BUZZER, ASSEMBLY			1
E3	PQWP2T2388M	P. C.BOARD (NLA)			1
CERAMIC FILTER					
CF1	PQVBKBR480B1	CERAMIC FILTER			1
Ref No.	Part No.	Value	Ref No.	Part No.	Value
RESISTORS					
R1	PQ4R10XJ104	100K Δ	R21	PQ4R10XJ101	100
R2	PQ4R10XJ683	68K Δ	R22	PQ4R10XJ472	4.7K
R3	ERDS2TJ472	4.7K Δ	R23	PQ4R10XJ103	10K
R4	ERDS1TJ470	47 Δ	R24	PQ4R10XJ224	220K
R5	PQ4R10XJ104	100K Δ	R25	PQ4R10XJ474	470K
R6	PQ4R10XJ152	1.5K	R26	PQ4R10XJ474	470K
R7	PQ4R10XJ272	2.7K	R27	PQ4R10XJ100	10
R8	PQ4R10XJ154	150K	R28	PQ4R10XJ104	100K
R9	PQ4R10XJ473	47K	R29	PQ4R10XJ105	1M
R10	PQ4R10XJ151	150	R30	PQ4R10XJ105	1M
R11	ERDS2TJ152	1.5K	R31	PQ4R10XJ152	1.5K
R12	ERDS2TJ150	15	R32	PQ4R10XJ104	100K
R13	PQ4R10XJ153	15K	R33	PQ4R10XJ123	12K
R14	PQ4R10XJ472	4.7K	R34	PQ4R10XJ822	8.2K
R15	PQ4R10XJ152	1.5K	R35	PQ4R10XJ335	3.3M
R16	PQ4R10XJ564	560K	R36	PQ4R10XJ122	1.2K
R17	Not Used		R37	PQ4R10XJ104	100K
R18	PQ4R10XJ154	150K	R38	PQ4R10XJ125	1.2M
R19	PQ4R10XJ105	1M	R51	ERDS2TJ681	68C
R20	PQ4R10XJ103	10K	R52	PQ4R10XJ222 (for Hearing Aid Coil)	2.2K
CAPACITORS					
C1	ECEA1AU100	10	C17	PQCUV1E104ZF	0.1
C2	PQCUV1H103KB	0.01 Δ	C18	ECEA0JKS101	100
C3	Not Used		C19	PQCUV1C683MD	0.068
C4	ECEA1HU4R7	4.7	C20	PQCUV1E104ZF	0.1
C5	PQCUV1H562KB	0.0056	C21	ECEA0JK331	330
C6	PQCUV1E473MD	0.047	C22	PQCUV1H101JC	100P
C7	PQCUV1H101JC	100P	C23	PQCUV1H101JC	100P
C8	ECEA1HU3R3	3.3	C24	PQCUV1H101JC	100P
C9	ECEA1AU470	47	C25	PQCUV1H101JC	100P
C10	ECEA1HU100	10	C26	Not Used	
C11	PQCUV1H103KB	0.01	C27	PQCUV1E153MD	0.015
C12	PQCUV1H103KB	0.01	C28	PQCUV1H101JC	100P
C13	PQCUV1H562KB	0.0056	C29	PQCUV1H101JC	100P
C14	PQCUV1E473MD	0.047	C30	PQCUV1E473MD	0.047
C15	PQCUV1E104ZF	0.1	C35	PQCUV1H103KB	0.01

REPLACEMENT PARTS LIST

Cradle for Model KX-T2388

Notes:

1. Printed circuit board assembly with mark (NLA) is no longer available after production discontinuation of the complete set.

2. Important safety notice.

Components identified by the Δ mark special characteristics important for safety.

when replacing any of these components, use only manufacturer's specified parts.

3. The S mark indicates service standard parts and may differ from production parts.

4. RESISTORS & CAPACITORS

Unless otherwise specified.

All resistors are in ohms (Ω) $K=1000\Omega, M=1000k\Omega$

All capacitors are in MICRO FARADS (μF) $P=\mu\mu F$

*Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	ERDS,PQRD:Carbon
ERD:Carbon	ERG:Metal Oxide	PQRQ:Fusible Resistor
RRD:Chip	ERO:Metal Film	PQ4R:Chip

Wattage

10,16,18:1/8W	14,25,S2:1/4W	12,50,S1:1/2W	1:1W	2:2W	3:3W
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*Type & Voltage of Capacitor

Type

ECCF: Semi-Conductor	ECCD,ECKD,PQCB,C,ECBC : Ceramic
ECQS: Styrol	ECQM,ECQV,ECQE,ECQG : Polyester
PQCBX,ECUV,PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECMS:Mica	EECW : Electric Double Layer

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others		
1H:50V	05:50V	OF:3.15V	0J :6.3V	1V :35V	
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V	
2E:250V	2:200V	1V:35V	1C :16V	1J :63V	
2H:500V		OJ:6.3V	1E,25:25V	2A :100V	

Ref. No.	Part No.	Part Name & Description	Pcs
----------	----------	-------------------------	-----

CASSETTE DECK PARTS

M1	PQFM9913Z	Motor Ass'y (with Pulley)	1
M2	PQFD9913Z	Pinch Roller Ass'y	1
M3	PQFF9909Z	Flywheel Ass'y	1
M3-1	PQFN35Z	Washer	1
M4	PQFG9905Y	Gear Ass'y	1
M4-1	PQFN48Z	Washer	1
M5	PQFR9912Z	Takeup Reel Table Ass'y	1
M6	PQFR9914Z	Supply Reel Table Ass'y	1
M7	PQFD82Y	Head Base Plate	1
M8	PQFW42Z	Head Base	1
M9	PQFS73Z	Spring	1
M10	PQJH1M2Z	R/P Head	1
M11	PQJH6M2Z	Erase Head	1
M12	PQFS109Z	Spring	1
M13	PQFS110Z	Spring	1
M14	PQFJ2Z	Terminal	1
M15	PQFC9909X	Mechanism Chassis Ass'y	1
M16	PQFI14Z	Rubber Parts, Motor Spacer	2
M17	PQUP589Z	Reed Switch P.C. Board	1
M18	PQJS9B30Z	Connector, 9Pin	1
M19	PQFN33Z	Washer (for Oil cut)	2
M20	PQFB12Z	Belt	1
M21	PQFD64Z	Plate Spring	1
M22	PQFS82Z	Spring	2
M23	PQFP126Y	Plunger	1
M24	PQHD15Z	Screw	2
M25	PQFN49Z	Washer (for lock of flywheel)	1

INTEGRATED CIRCUITS, TRANSISTORS AND DIODES

IC1	PQVI4149HA35	IC	1
IC2	PQVISC79100P	IC	1
IC3	PQVIBA8205	IC	1 Δ
IC4, 5	PQVIIR3N05	IC	2
IC6	PQVINJM4558D	IC	1
IC7	PQVIBA6220	IC	1

Ref. No.	Part No.	Part Name & Description	Pcs
Q3	PQVTKSD261CY	TRANSISTOR(SI)	1
Q4, 8, 10	2SC1740S	TRANSISTOR(SI)	8
,11,15~18			
Q5	2SD2137	TRANSISTOR(SI)	1
Q6	2SD2136	TRANSISTOR(SI)	1
Q9, 12~14	2SA854	TRANSISTOR(SI)	4
Q101	2SA1625	TRANSISTOR(SI)	1 Δ
Q102	2SD662B	TRANSISTOR(SI)	1 Δ
D1~4, 13,	1SS131	DIODE(SI)	11 Δ
14, 16, 18,			
19, 25, 26			
D5~8	PQVDS5688G	DIODE(SI)	4 Δ
D9	MA4300	DIODE(SI)	1 Δ
D10	MA4180	DIODE(SI)	1
D11, 21	PQVDMTZ6R8	DIODE(SI)	2
D12, 23, 24	1SS119	DIODE(SI)	3
D15	MA4062	DIODE(SI)	1
D20	PQVDMTZ11B	DIODE(SI)	1
LED1	PQVDSLZ135B2	LED	1
LED2	PQVDSLZ235B3	LED	1

SWITCHES

S1~6	EVQ12405K	SWITCH, P/B, REW, MEMO etc.	6
S7, 10	PQSS3A17W	SWITCH, RINGS, RINGER	2
S8	PQSS2A27W	SWITCH, CPC	1
S101	ESE14A211	SWITCH, HOOK	1
S200	PQSE91Z	SWITCH, REED (for DECK)	1

JACKS

JJ1	PQJJ1TB18Z	JACK, HANDSET	1
JJ2	PQJJ2HA2Z	JACK, DC IN, TELEPHONE	1 Δ

CABINET PARTS

K1	PQYMT2388M	UPPER CABINET ASSEMBLY	1
K2	PQYF1053Y8	LOWER CABINET ASSEMBLY	1
K3	PQBE35Z	BUTTON, HOOK	1
K4	PQBCX193Z	BUTTON, PLAYBACK, MEMO, etc.	1
K5	PQBD164Z	KNOB, VOLUME	1
K6	PQHP5104Z	TELEPHONE CARD	1
K7	PQHRS385Z	TRANSPARENT PLATE	1
K8	PQKE81Z	HANDSET HANGER	1
K9	PQKG12Z	CASSETTE LID	1
K10	PQQT5157Z	INDICATION PLATE LABEL	1
K11	PQQT52Y	CODE LABEL	1

ELECTRICAL PARTS

E1	PQAS5P05Z	SPEAKER	1
E2	PQJ117Z	MICROPHONE	1
E3	PQWH1T2388M	BUZZER ASSEMBLY	1
E4	PQHG553Z	RUBBER, MICROPHONE COVER	1
E5	PQJP11D106Z	CONNECTOR, 12 PIN (CN1-1)	1
E6	PQJS11X41Z	CONNECTOR, 12 PIN (CN1-2)	1
E7	PQJP9D105Z	CONNECTOR, 9 PIN (CN2)	1
E8	PQWP1T2388M	CRADLE, P.C.BOARD (NLA)	1

OTHERS

SA1	PQVDSAE310F1	VARISTOR	1 Δ
VR1	PQVAP1B14A	VARIABLE RESISTOR	1
VR2, 3	EVNDXA03B53	VARIABLE RESISTOR, 5K Ω	2
VR4	EVNDXA03B52	VARIABLE RESISTOR, 500 Ω	1
X1	PQVBFC4004A3	CERAMIC FILTER	1
PC1	PQVIPC817K	PHOTO ELECTRIC TRANSDUCER	1

Ref. No.	Part No.	Part Name & Description		Pcs	
ACCESSORIES					
A1	KX-A11-W	AC ADAPTOR		1	
A2	PQJA59Y	TELEPHONE CORD		1	
A3	PQKL36Z	STAND		1	
A4	PQJA30M	HANDSET CORD		1	
A5	PQJN1M30AY	MAGNETIC RECORDING TAPE		1	
A6	PQQX6281Z	INSTRUCTION BOOK		1	
PACKING MATERIALS					
P1	PQPK1201Z	GIFT BOX		1	
P2	PQPN1181Z	CUSHION		1	
P3	PQPN1182Z	ACCESSORY BOX		1	
P4	XZB23X35A01	PROTECTION COVER (for SET)		1	
P5	PQPH75Z	PROTECTION COVER (for HANDSET)		1	
Ref No.	Part No.	Value	Ref No.	Part No.	Value
RESISTORS					
R1	Not Used		R46	PQ4R10XJ103	10K
R2	PQ4R10XJ153	15K Δ	R47	PQ4R10XJ823	82K
R3	PQ4R10XJ823	82K	R48	PQ4R10XJ223	22K
R4	PQ4R10XJ224	220K Δ	R49	ERDS2TJ123	12K
R5	PQ4R10XJ393	39K	R50	PQ4R10XJ563	56K
R6	PQ4R10XJ392	3.9K	R51	PQ4R10XJ563	56K
R7	Not Used		R52	PQ4R10XJ113	11K
R8	Not Used		R53	ERDS2TJ273	27K
R9	PQ4R10XJ473	47K	R54	PQ4R10XJ273	27K
R10	ERDS1TJ220	22	R55	PQ4R10XJ823	82K
R11	PQ4R10XJ102	1K	R56	PQ4R10XJ473	47K
R12	PQ4R10XJ153	15K	R57	PQ4R10XJ471	470
R13	ERDS1TJ680	68	R58	PQ4R10XJ473	47K
R14	PQ4R10XJ223	22K	R59	PQ4R10XJ471	470
R15	PQ4R10XJ681	680	R60	ERDS2TJ681	680
R16	PQ4R10XJ121	120	R61	PQ4R10XJ473	47K
R17	PQRQ2VJ100	10	R62	PQ4R10XJ221	220
R18	ERDS1TJ391	390	R63	PQ4R18XJ681	680
R19	ERDS1TJ221	220	R64	ERDS2TJ103	10K
R20	PQ4R10XJ473	47K	R65	PQ4R10XJ221	220
R21	PQ4R10XJ683	68K	R66	PQ4R10XJ151	150
R22	Not Used		R67	PQ4R10XJ394	390K
R23	PQ4R10XJ224	220K	R68	PQ4R10XJ334	330K
R24	PQ4R10XJ223	22K	R69	PQ4R10XJ682	6.8K
R25	PQ4R18XJ102	1K	R70	PQ4R10XJ473	47K
R26	PQ4R18XJ221	220	R71	ERDS2TJ824	820K
R27	PQ4R10XJ105	1M	R72	PQ4R10XJ333	33K
R28	PQ4R10XJ104	100K	R73	PQ4R10XJ682	6.8K
R29	PQ4R10XJ183	18K	R74	PQ4R10XJ123	12K
R30	PQ4R10XJ473	47K	R75	PQ4R10XJ334	330K
R31	Not Used		R76	PQ4R10XJ221	220
R32	PQ4R10XJ473	47K	R77	PQ4R10XJ122	1.2K
R33	PQ4R10XJ471	470	R78	PQ4R10XJ223	22K
R34	PQ4R10XJ103	10K	R79	Not Used	
R35	ERDS2TJ120	12	R80	PQ4R10XJ331	330
R36	PQ4R10XJ681	680	R81	PQ4R10XJ104	100K
R37	PQ4R10XJ105	1M	R82	PQ4R10XJ683	68K
R38	ERC14GM226	22M	R83	PQ4R10XJ103	10K
R39	PQ4R10XJ330	33	R84	PQ4R10XJ334	330K
R40	Not Used		R85	PQ4R10XJ102	1K
R41	PQ4R10XJ473	47K	R86	ERDS2TJ824	820K
R42	PQ4R10XJ103	10K	R101	ERDS1TJ622	6.2K Δ
R43	PQ4R10XJ912	9.1K	R107	PQ4R10XJ104	100K Δ
R44	PQ4R10XJ105	1M	R108	PQ4R10XJ472	4.7K Δ
R45	PQ4R10XJ562	5.6K	R400	PQRDS2TJ563 (for DECK)	56K

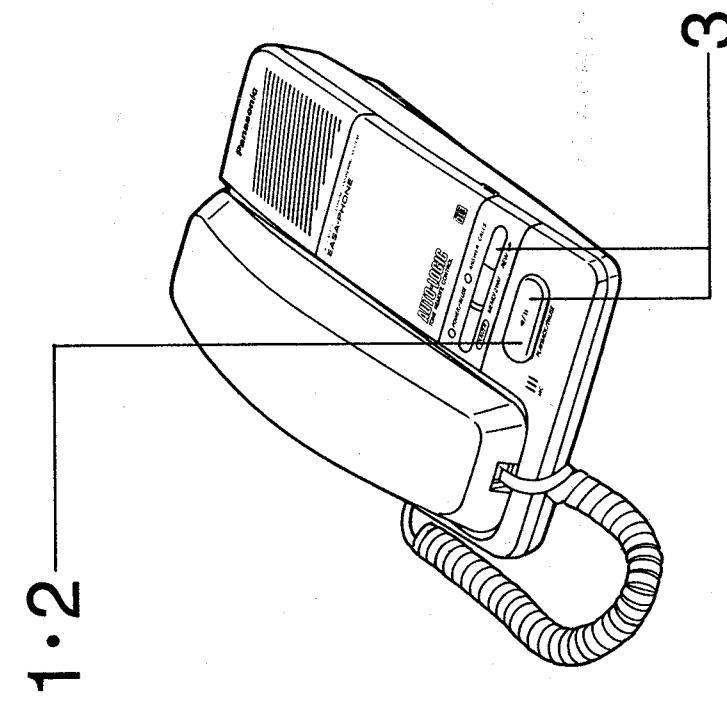
Ref No.	Part No.	Value	Ref No.	Part No.	Value
CAPACITORS					
C1	Not Used		C31	PQCUV1H223KB	0.022
C2	Not Used		C32	ECEA1HKS3R3	3.3
C3	ECEA1HKS22	0.22 Δ	C33	PQCB1C103MY	0.01
C4	ECQG1H822JZ	0.0082	C34	PQCB1C103MY	0.01
C5	PQCB1C103MY	0.022	C35	PQCUV1H103KB	0.01
C6	ECKD2H681KB	680P Δ	C36	ECEA1AKS330	33
C7	ECKD2H681KB	680P Δ	C37	ECUV1H104MD	0.1
C8	ECEA1HKS3R3	3.3	C38	PQCUV1H102J	0.001
C9	Not Used		C39	ECEA1CKS100	10
C10	Not Used		C40	PQCUV1H471JC	470P
C11	ECEA1AU222	2200	C41	ECEA1AU101	100
C12	ECEA1HKS3R3	3.3	C42	ECFD1E473KD	0.047
C13	PQCUV1H103KB	0.01	C43	PQCUV1E153MD	0.015
C14	ECEA1CKS100	10	C44	PQCUV1H681JC	680P
C15	ECEA1EU4R7	4.7	C45	ECEA1CKS100	10
C16	PQCB1C103MY	0.01	C46	ECEA1HUR47	0.47
C17	ECEA1CKS100	10	C47	ECEA0JU471	470
C18	ECEA1HKS3R3	3.3	C48	Not Used	
C19	PQCB1C103MY	0.022	C49	ECEA1AU101	100
C20	ECEA1AU101	100	C50	Not Used	
C21	ECQV1H104JZ	0.1	C51	PQCB1C103MY	0.01
C22	ECQV1H683JZ	0.068	C52	PQCUV1H103KB	0.01
C23	PQCUV1H151JC	150P	C53	PQCUV1H103KB	0.01
C24	ECFD1C333KD	0.033	C54	PQCB1C103MY	0.01
C25	ECEA1CKS100	10	C55	PQCUV1E104ZF	0.1
C26	ECUV1H473MD	0.047	C56	PQCUV1H103KB	0.01
C27	PQCUV1H102J	0.001	C57	PQCB1C103MY	0.01
C28	ECUV1H333JC	0.033	C58	PQCUV1H562KB	0.0056
C29	ECEA1HKS0R1	0.1	C101	ECQE2105KF	1 Δ
C30	PQCUV1H152KB	0.0015	C102	ECEA1HKS100	10 Δ

OPERATIONS

Setting the Answering Machine to Record Incoming Messages

Press the POWER button to turn on the unit. (The POWER/IN USE indicator light is on.)

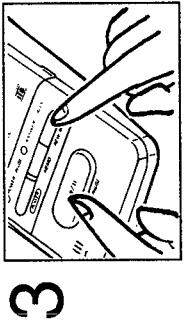
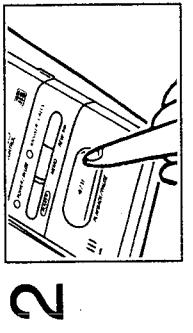
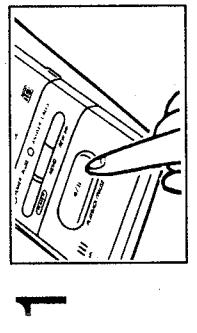
After 10 seconds, the unit will be ready to answer the calls. The ANSWER/CALLS indicator light is on. (Answer mode)



Recording after the messages you want to save

When you want to record the next Incoming Messages after the last recorded message, or after the desired position of the tape:

1 Press the PLAYBACK/PAUSE button to play back the tape to the end of the message you want to save.



2 Press the PLAYBACK/PAUSE button again to pause the unit.

The POWER/IN USE indicator flashes. (pause mode)

3 Press the REW button and the PLAYBACK/PAUSE button simultaneously.

The POWER/IN USE indicator and the ANSWER/CALLS indicator lights are on. After 2 seconds, the unit will rewind the tape and reset it. New calls will be recorded after the message you have saved.

■ Answer mode
When a call is received, the unit answers call and record the Incoming Message.

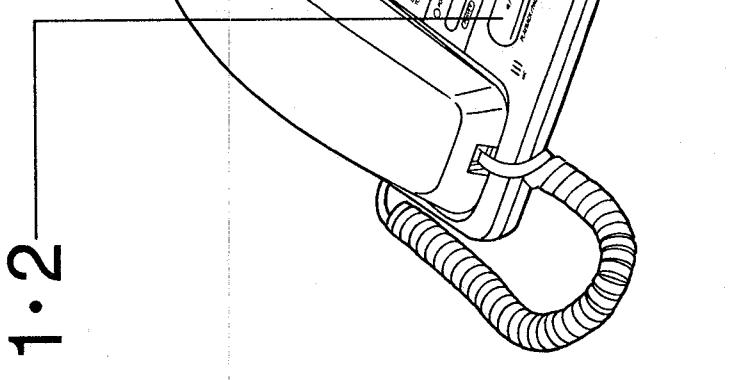
■ If you do not want the unit to answer the call, press the POWER button to turn off the unit. The ANSWER/CALLS indicator light will go out.

■ The caller's recording time is limited up to 60 seconds.

Listening to Recorded Messages

When an Incoming Message (ICM) has been recorded, the ANSWER/CALLS indicator will flash in groups. The amount of flashes indicates the number of calls received up to 15 times. (Three flashes followed by a pause means that 3 messages were received.)

In case of power interruption, the indicator will flash slowly.



Playing back the tape from the beginning

1 Press the PLAYBACK/PAUSE button to play back the messages from the beginning.

Adjust volume, if needed. 3 beeps will be heard indicating the end of the last message.

The unit will rewind the tape and next Incoming Message will be recorded from the beginning of the ICM part of the tape.

2 Press the PLAYBACK/PAUSE button to stop the tape (pause mode).

The POWER/IN USE indicator flashes.

3 Press the button again to restart playback.

Press the REW button to rewind the tape to the desired location.

The unit will play back the message again after you release the REW button.

If you keep pressing the REW button until a beep is heard, the unit rewinds all the ICM part of the tape and reset to the answer mode.

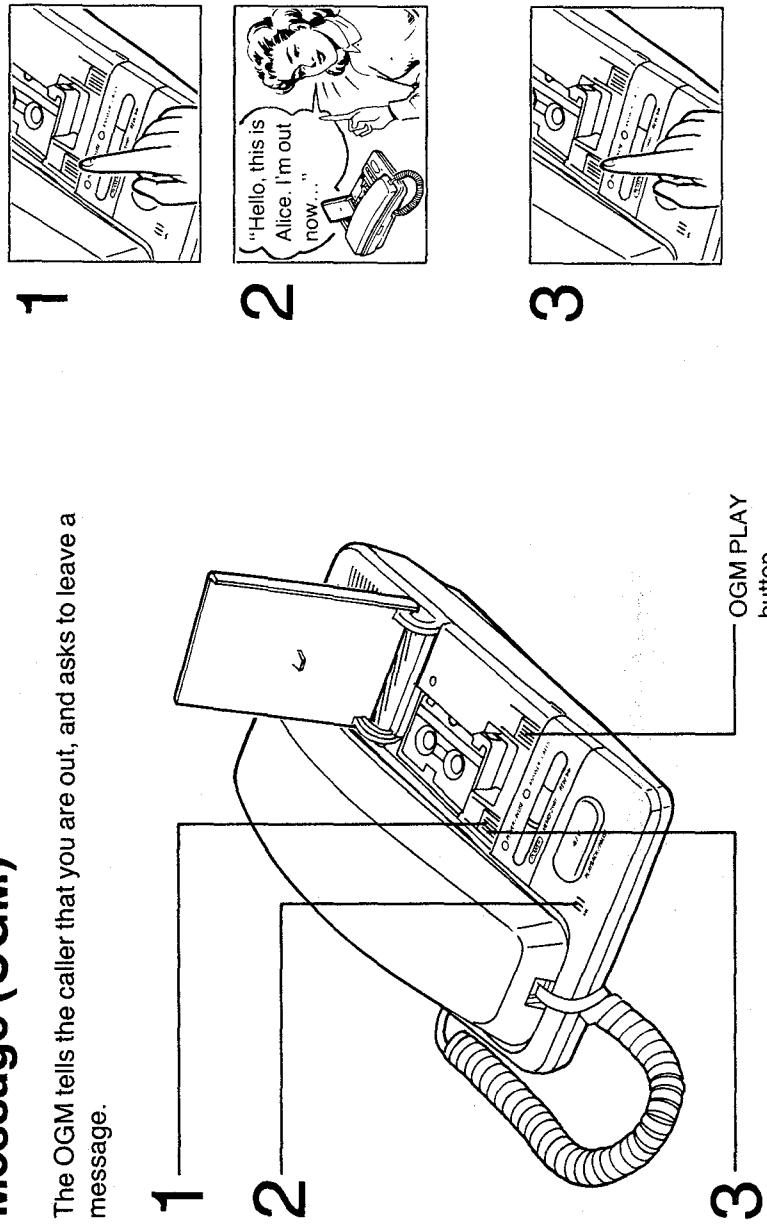
In this case, the unit will not play back the message any more.

INTO LOGIC™ Operation

At the touch of the PLAYBACK/PAUSE button, the unit will automatically rewinds and play back all the recorded messages. 10 seconds after playback, the unit will rewind the tape and be ready for recording incoming calls automatically.

Recording an Outgoing Message (OGM)

The OGM tells the caller that you are out, and asks to leave a message.



Confirm that the POWF 'IN USE' indicator light is on. Your OGM can be up to 60 seconds long.

Press the OGM REC button, then release it. A series of short beeps will be heard, followed by a long beep and the POWER/IN USE indicator flashes.

Speak loudly and clearly right after the beep, about 20 cm (8") away from the microphone.

Do not pause for over 2 seconds while recording. If you do, a beep sounds six times. In this case, go back to step 1 and start again.

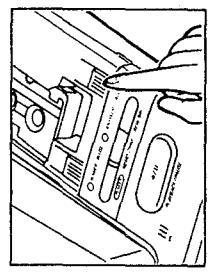
Press the OGM REC button again when you finished recording.

The tape rewinds, and the unit will be ready to answer incoming calls after 10 seconds.

Checking your recorded message (OGM)

Press the OGM PLAY button.

Press the OGM PLAY button again if you want to stop the operation halfway. The unit will be ready to answer incoming calls after 10 seconds.



Sample OGM

Please record the bold-faced sentence surely on the OGM. Caller's recording time is up to 60 seconds.

A series of short beeps will be heard while the tape is preparing for recording, and a long beep means the tape is ready.

"Hello, this is Dick Smith. I'm out now, but if you leave a message, I'll call you back. You will hear a series of short beeps then a long beep will be heard certainly. **Speak after the long beep. You have 60 seconds.**"

Remote Operation

You can retrieve the recorded Incoming Messages from a remote location with a tone phone by simply pressing your own remote code number.

The remote code number

A remote code number for you is preset and indicated on the bottom of the unit.

Playing back all the messages

Call your unit.



1 Example Dial your code number for 1~2 seconds while the OGM is playing. The unit rewinds the tape and plays back all the messages. To rewind, dial the code number for 1~2 seconds while playing back.

The tape will rewind for approximately 15 seconds corresponding to the playback time.

After the last message, 3 beeps will sound and you may hang up. Messages are automatically saved after hanging up.

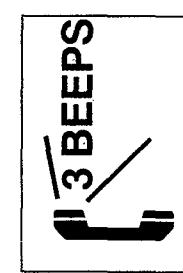
KX-T2388

KX-T2388

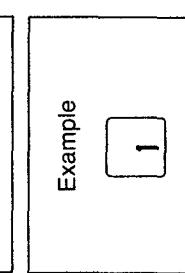
Resetting the ICM tape for future message

After listening to the messages, you can reset the tape and record new messages from the beginning.

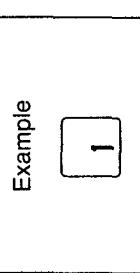
Wait for 3 beeps after the last message.



1



2



3

Dial the code number within 10 seconds of hearing 3 beeps. A series of short beeps sound while the unit rewinds the tape to the beginning. Future messages will be recorded and the old messages will be erased.

Recording a marker message

After listening to all your messages, you can leave a message on the same call. When replay is finished, wait for 3 beeps indicating the end of the last message. Then wait about 10 seconds for another 2 beeps indicating that the tape is ready for recording.

1 Leave your message after the last 2 beeps.
2 When you finished your marker message, hang up.

Setting the answer mode remotely

You can easily set the answer mode from a remote telephone.

1 Call your unit and let the telephone ring 15 times.
2 The unit will answer, and the OGM will be heard, then hang up.
The unit will be ready to answer the next phone call.

Service Manual

and Technical Guide

Telephone Equipment

KX-T2388

Supplement-1

AUTO-LOGIC™

EASA-PHONE.

Integrated Telephone System
with a Single Micro Cassette

•Please use this manual together with the Service Manual for model No. KX-T2388, Order No. KM49008259C1.

CHANGES

Suffix	B,C	8HAQB12345	← Serial No. Label
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	Suffix	Reason for suffix change
1	A → B	The main P.C.Board has been changed to comply with UL regulations.
2	B → C	The main P.C.Board has been changed in order to cut cost.

Suffix	A	B	C
Main P.C.Board	PQUP948ZA-B	PQUP948YA	PQUP948XA

Panasonic

■ PARTS COMPARISON TABLE

Reason for Change	The circled item indicates the reason. If no marking, see the Notes in the bottom column.
1. Improve performance	
2. Change of material or dimension	
3. To meet approved specification	
4. Standardization	
5. Addition	
6. Deletion	
7. Correction	
8. Other	

Interchangeability Code **The circled item indicates the interchangeability. If no marking, see the Notes in the bottom column.

Parts	Set Production	
A Original New →	Early Late →	Original or new parts may be used in early or late production set. Use original parts until exhausted, then stock new parts.
B Original New →	Early Late →	Original parts may be used in early production sets only. New parts may be used in early or production sets. Use original parts where possible, then stock new parts.
C Original New →	Early Late →	New parts only may be used in early or late production sets. Stock new parts.
D Original New →	Early Late →	Original parts may be used in early production sets only. New parts may be used in late production sets only. Stock both original and new parts.
E Other		

CRADLE

Ref. No.	Part No.	Part Name & Description	Pcs/ Set	Note 1	Note 2	Time of Change (Suffix)
	Original Parts No.	New Parts No.				
MECHANICAL PARTS						
M3	PQFF9909Z	PQFF9909Y	1	1*	1D	Mid of B
M10	PQJH1M2Z	PQJH1M2Y	1		3B	B
M15	PQFC9909X	PQFC9909W	1	1*	1D	Mid of B
M17	PQUP589Z	PQUP589Y	1		2A	Mid of B
M17	PQUP589Y	PQUP864Z	1		3B	B
M26	-----	PQHR321Z	1		5	B
IC, TRANSISTORS AND DIODES						
IC 1	PQVI4149HA35	PQVI4149HA45	1		1A	Mid of B
Q6	2SD2136	2SD1994A	1	2*	1D	Mid of B
D21	PQVDMTZ6R8	-----	0	2*	6	Mid of B
CABINET PART						
K2	PQYF1053Y8	PQYF1053X8	1		3B	B
ELECTRICAL PART						
E8	PQWP1T2388M	PQWP1T2388M1	1		3B	B
OTHERS						
SA1	PQVDSAE310F1	PQVDDSV301LA	1		3B	B
F1	-----	PQBA1N02NMAL	1		5	B
ACCESSORIES						
A2	PQJA59Y	PQJA59V	1		3B	B
A4	PQJA30M	PQJA212M	1		3B	B
RESISTORS						
R10	ERDFS1TJ220	ERDFS1TJ220	1		3D	B
R13	ERDFS1TJ680	ERDFS1TJ330	1		3D	B
R56	PQ4R10XJ473	PQ4R10XJ471	1	2*	1D	Mid of B
R57	PQ4R10XJ471	PQ4R10XJ102	1	2*	1D	Mid of B
R58	PQ4R10XJ473	PQ4R10XJ471	1	2*	1D	Mid of B
R58	PQ4R10XJ471	PQ4R10XJ681	1		1A	Mid of B
R59	PQ4R10XJ471	PQ4R10XJ102	1	2*	1D	Mid of B
R87	-----	ERDFS1TJ330	1		5	B
R88	-----	ERDFS1TJ474	1		5	B
CAPACITORS						
C29	ECEA1HKS0R1	ECFD1C104KD	1		1D	C
C33	PQCB1C103MY	PQCB1C103MY	1		7	-----
C42	ECFD1E473KD	PQCUV1E473MD			1D	C
C47	ECEAOJU471	ECEA1HU100	1		1A	Mid of B
C57	PQCB1C103MY	PQCUV1H103KB	1		1D	C
C59	-----	ECKTAE103ZF	1		5	B

Notes: 1. Part with mark 1* has been changed at the same time. (Feb. 1991)
 2. Part with mark 2* has been changed at the same time. (Jan. 1991)

HANDSET

Ref. No.	Part No.	Part Name & Description	Pcs/ Set	Note 1	Note 2	Time of Change (Suffix)
	Original Parts No.	New Parts No.				
IC						
IC 1	PQVI451N9968	PQVI001L9968	IC	1	1 A	Mid of B
JACK						
JJ 1	PQJJ1TB2Y	PQJJ1TB2T	Jack, Handset	1	3 B	B
SWITCH						
S7~21	PQSE115Z	PQSE117Z	Switch, 12key, Direct	1	7	-----
CABINET PARTS						
K1	PQKM205Z8	PQKM205Y8	Upper Cabinet (Change 1)	1	1 A	Mid of B
K1	PQKM205Y8	PQKM205X8	Upper Cabinet (Change 2)	1	3*	1 D
K7	PQNW500Z	-----	Washer	0	6	Mid of B
ELECTRICAL PARTS						
E1	PQJM115Z	PQJM129Z	Microphone	1		Mid of B
E2	PQWH2T2388M	PQWH2T2388M1	Buzzer Assembly	1	3*	1 D
E3	PQWP2T2388M	PQWP2T2388M1	P.C. Board Assembly (NLA)	1	3 B	B
RESISTOR						
R4	ERDS1TJ470	ERDFS1TJ470	Resistor, 47Ω	1	3 D	B
CAPACITOR						
C50	-----	PQCUV1H102J	Capacitor, 0.001μF	1	5	Mid of B

Notes: 1. Part with mark 3* has been changed at the same time. (Jun. 1991)

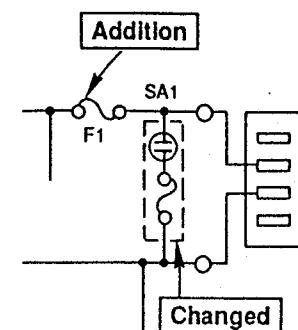
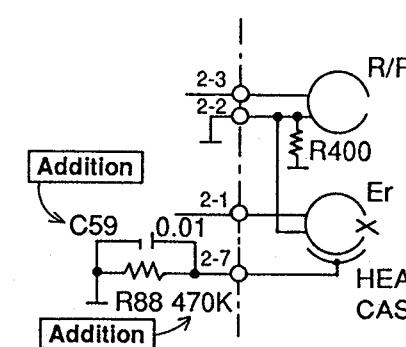
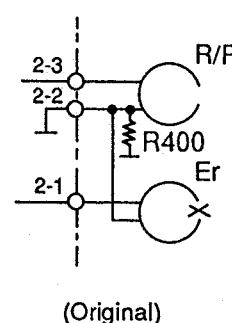
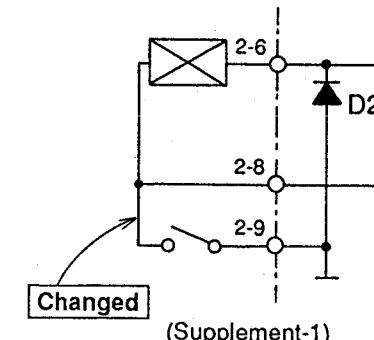
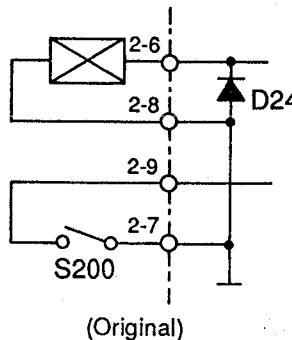
CPU DATA (page 6)

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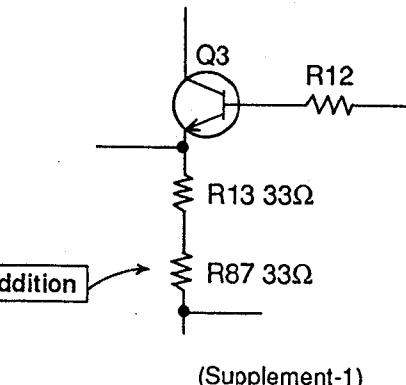
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(Original)

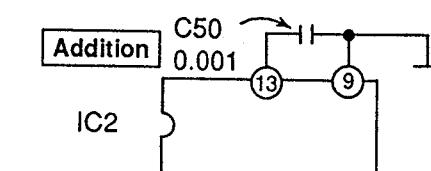
(Supplement-1)

SCHEMATIC DIAGRAM (for Cradle)

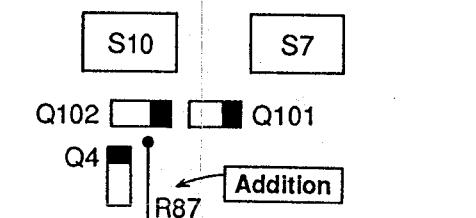
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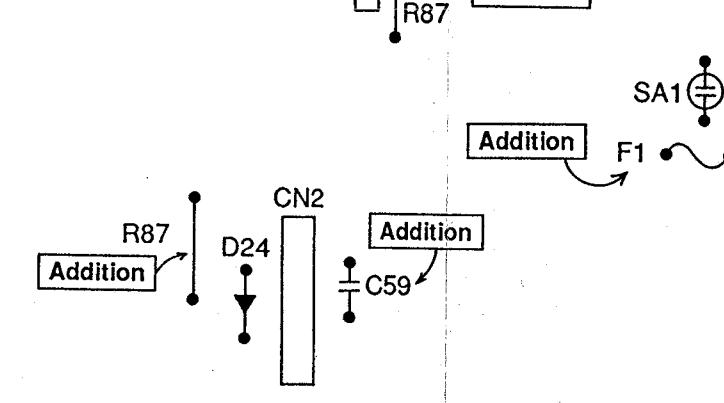
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SCHEMATIC DIAGRAM (for Handset)

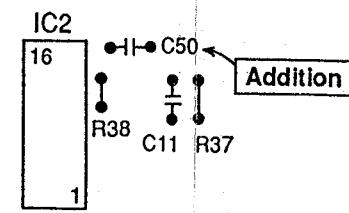
(Supplement-1)

CIRCUIT BOARD (for Cradle)

S10
S7
Q101
Q4
R87



(Supplement-1)

CIRCUIT BOARD (for Handset)

(Supplement-1)

HAN

Ref.

IC

IC 1

JACK

JJ 1

SWIT

S7-2

CABII

K1

K1

K7

ELEC

E1

E2

E3

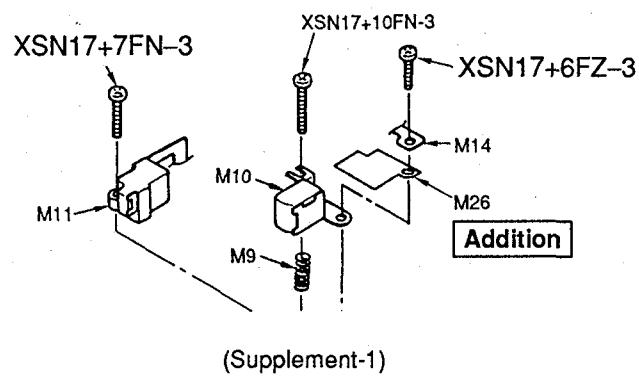
RESI

R4

CAPA

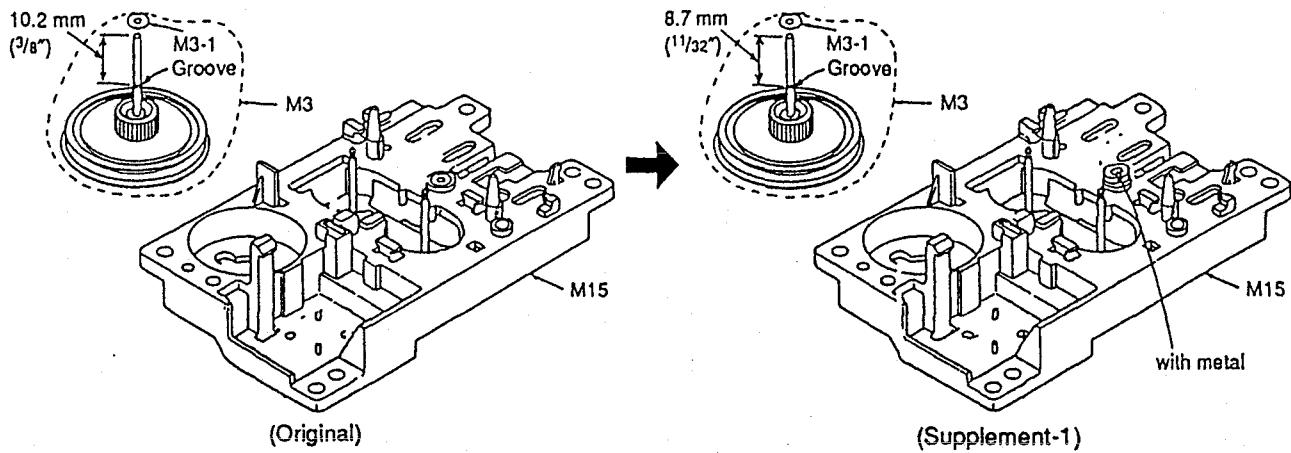
C50

■ CASSETTE DECK PARTS LOCATION (Page 41)



Notes

■ CF



■ SC